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The MODEL ENGINEER and Light Machinery Review

66 Farringdon St.
London EC4
Founded 1898

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A Journal of
Small Power
Engineering

Vol. 69. No. 1451.

THURSDAY, FEBRUARY 28, 1929.

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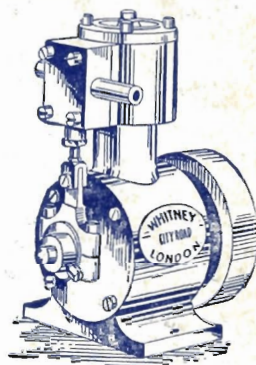
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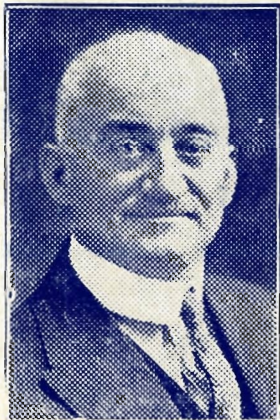
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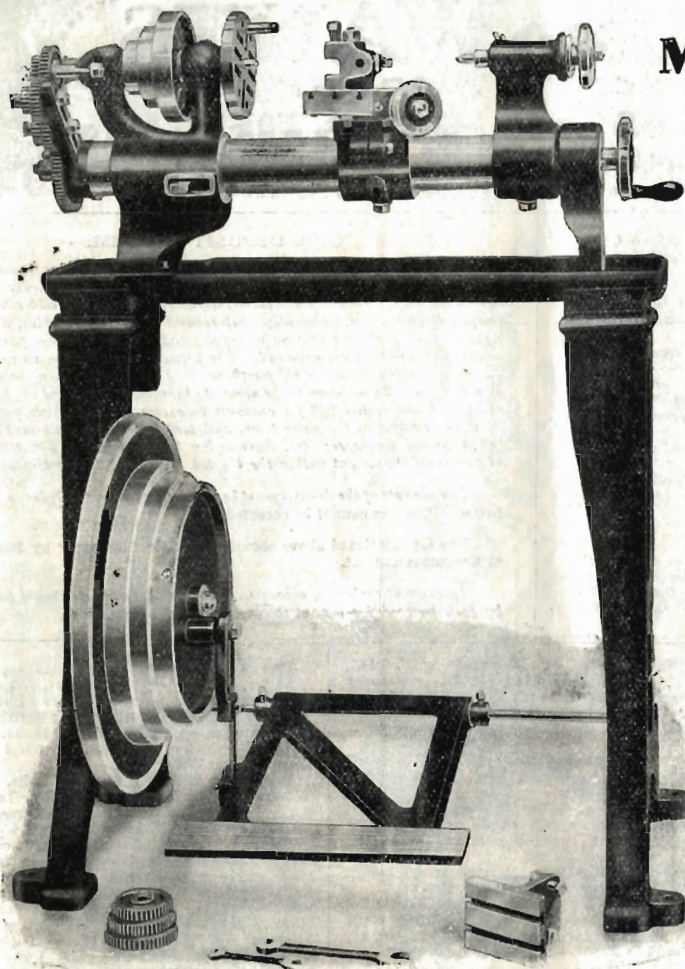
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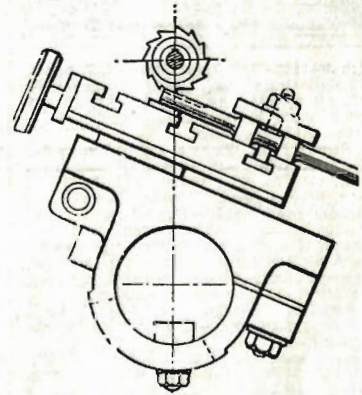
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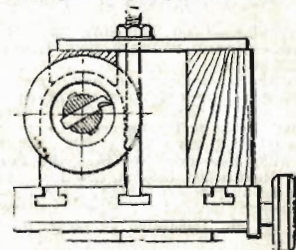
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All advertisements in these columns must be prepaid, and remittances should be made by Postal Orders or Stamps, and sent to the Advertisement Manager, "The Model Engineer," 66, Farringdon Street, London, E.C.4.

Please state under which Classified Heading you wish your advertisement to appear; the classifications are as follows:—

General, Models, Wireless, Motoring.
Tools, Engines, Electrical, Business, Wanted.

Advertisers are requested to send in their announcements as early in the week as possible, as although we accept advertisements up till the first post on Friday preceding the date of issue, we cannot guarantee the insertion of those arriving on this day. Telephone: Central 9071.

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We will receive from intending purchasers the purchase money of any article advertised or sold by our advertisers, and will acknowledge its receipt to both the Depositor and the Vendor, whose full names and addresses must be given. Unless otherwise arranged beforehand between the parties, it is understood that all goods are sent on approval, and that each person pays carriage one way if the goods are returned. The deposit is retained by us until we are advised of the completion of the purchase, or of the articles having been returned and accepted. In addition to the amount of the deposit, a fee of 1/- for the sum of £1 and under, and 1/8 for amounts in excess of £1, to cover postage, etc., must be remitted at the same time, and sent to the Advertisement Manager, "The Model Engineer," 66, Farringdon Street, London, E.C.4. In cases of persons not resident within the United Kingdom, double fees are charged.

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Profitable Fireside Industry. Making Lead Solders. Complete apparatus, 60s.—STOWELL, Woodingdean, Brighton.

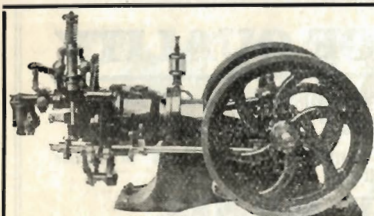
Ascending!—61" Gap Screw-cutting Lathe, self-acting, skidding, surfacing, change wheels, over-shaft, by Hand, 50 19s.—Below.

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(Continued on page vii.)



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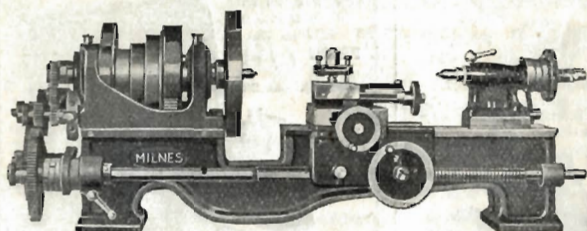
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LATHES OF QUALITY

Illustration shows our
3 $\frac{3}{4}$ " centre "R" type LATHE,
but we also invite your inquiries for all kinds of lathes
up to 6" centre.

HENRY MILNES,

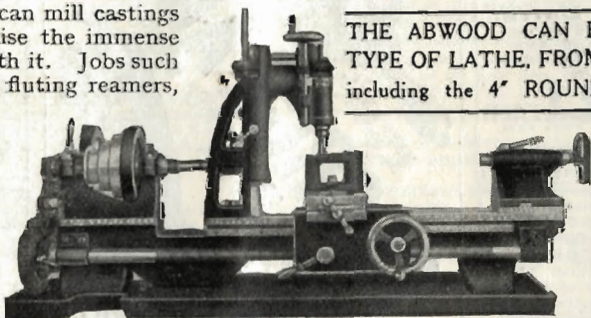
Ingleby Street Works, BRADFORD.

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Note the ease with which you can mill castings with the Abwood, and visualise the immense variety of work you can do with it. Jobs such as gearcutting, vertical boring, fluting reamers, etc., become everyday items.

The drive is positive, and utilizes the various speeds of lathe. Cutter head is adjusted by a screw and handwheel. Automatic feeds of lathe are used in conjunction with it.

In fact, it converts your lathe into an up-to-date milling machine at a low cost.



THE ABWOOD CAN BE FITTED TO ANY
TYPE OF LATHE, FROM 3' TO 7' CENTRES,
including the 4' ROUND-BED DRUMMOND.

PRICE :

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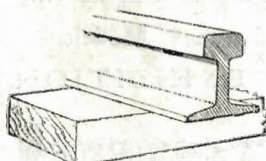
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for Gauge "O" or "1" (Brass).



with radius edges. Secured in the same simple way as real track, by spikes and bearing-collars, and a neat spring grip fishplate. Easily laid either on transverse or longitudinal sleepers, the material—brass—renders it an ideal garden track. In three-foot lengths.

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SLEEPERS, 3" ... per 100, 2/9

" 4" ... " 3/-

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Send 4d. for
Bond's 1929
102 page
Model List.

BOND'S o' Euston Rd., Ltd.

254, EUSTON ROAD, LONDON, N.W.1.

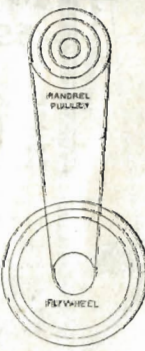
Special Point No. 3

ON THE

3 $\frac{1}{4}$ " SUPER EXE LATHE

Also on our 4" and 2 $\frac{1}{2}$ " Lathes.

BACK-GEAR-RATIO



BENCH LATHE,
£10:12:6

(exclusive of post,
except for North).

On the average, in the ordinary back-gear system, the slowest speed at which the cone pulley on mandrel can be driven is $\frac{3}{4}$ times the speed of flywheel and treadle, and the mandrel is geared down 7 to 1 from the cone pulley. Therefore, if the treadle is worked at 80 strokes per minute, the cone pulley runs at 280 and the mandrel at 40. On our 2 $\frac{1}{2}$ " Lathe the largest step on mandrel pulley is twice the diameter of the smallest step on flywheel (see diagram), so the 80 r.p.m. is reduced to 40 DIRECT (on our 4" Lathe the reduction would be to 25). Therefore, our direct "Back gear Ratio" gives the same speed reduction, and, by avoiding the gearing and the revolving of the cone pulley at high speed, vibration, noise and much friction are eliminated. Vibration will, of course, cause chatter, especially when facing, and noise is unpleasant in a house. As evidence that plenty of power is transmitted, all our Lathes can turn cast iron as large as they can swing. Our large mandrel pulley also, of course, provides the large division plate referred to in our last advert. Both the pulley and flywheel have four steps, so that an ample range of high and medium speeds are also provided.

The EXE ENGINEERING CO., LTD., EXETER.

The MODEL ENGINEER

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SMOKE RINGS



DESPITE the bitterly cold weather I fulfilled a long-standing promise to journey to Grantham to attend the opening of the Arts and Crafts Exhibition organised in connection with the Sports and Welfare Club of Messrs. Ruston and Hornsby, Limited, the well-known engineers. I may say that one of the considerations which enticed me away from my warm office fire was my admiration of the splendid organisation work put into this show by Mr. S. R. Sheane, who is a pupil at the works. Mr. Sheane first approached me at our last Exhibition, and told me what he had in hand for Grantham. Since then he has kept constantly in touch with me, reporting progress with the arrangements, and convincing me that Grantham was going to have a first-class show. An account of the exhibition appears elsewhere in this issue, and the pictures alone will indicate that I was not disappointed at the end of my journey. The local committee had put in some really good work, and I am sure they must have been just as pleased as the visitors were with the fine show of models they had got together. I was much impressed with the excellent arrangement of the model section, and the trouble taken to have most of the exhibits running. I am indebted to Mr. Lee for the two photographs. Mr. Lee, a prominent photographer in Grantham, is also a model "fan," but he confesses that model engineering is so attractive a hobby that he has to be careful not to let it lure him away during business hours. I have referred to the bitter cold weather; it takes a real enthusiast to stand out in an open yard with a temperature nearly down to zero, to look after an air compressor supplying the working models. Yet one of the committee cheerfully undertook this responsibility for the good of the show. I found him

with his hands in his pockets, dancing up and down on his feet to keep warm, watching the compressor gauge, and apparently thoroughly happy about it all; no wonder the show was a success with a committee like this. Mr. Sheane himself not only undertook all the secretarial work but found time to get several of his own models ready for exhibition, including a partly-finished uniflow engine entered in the class for work done during the past six months. He told me that the model boat club is shaping very well. I saw a number of boats, both power and sailing models, which are being got ready for the opening of the season. Lord Brownlow has placed the lake in his park at the disposal of the club, and is taking a keen personal interest in their doings. The Grantham model engineers are fortunate in having the help and encouragement of Mr. J. Tinn, the works manager of Messrs. Ruston & Hornsby, who appreciates the practical value of hobbies generally and of model engineering in particular. I had the opportunity of spending an hour or so in the firm's works during my visit, and, needless to say, found plenty to interest me in the modern machine tools which they are so well equipped. I found another model engineer in the person of the chief inspector, and spent some fascinating minutes with him in his laboratory examining the gauging devices and testing machines which keep such a useful check on the accuracy and quality of everything passing through the works. Grantham has definitely arrived as a centre of model engineering activity, and we shall all look forward to the extensions and developments which will undoubtedly occur with such an enthusiastic executive to foster them.

* * *

Another rather chilly journey I recently made was to the Birmingham section of the British Industries Fair. This section is devoted to the engineering, electrical and metal-working trades,

and its enormous proportions will be understood when I mention that the exhibition building covers a floor space of 400,000 square feet, all under one roof, and that there are three and a half miles of gangways between the trade stands. It is organised by the Birmingham Chamber of Commerce, under the official authority of the Board of Trade and the Birmingham City Council. It is first and foremost a gathering ground for both home and overseas trade buyers of the goods within its walls, but it is open to the public until March 1 at an admission charge of 2s. 6d. Prominent classes of exhibits are: hardware, wire goods, brass-foundry work, gas appliances, electrical equipment, and general engineering plant. In addition to the immense array of exhibits inside the hall, there are a number of important items of a bulky or heavy character shown in the grounds. These include locomotives, steam-rollers, tractors, excavating machinery, and railway and contractors' plant. Although exhibits of models were not very numerous, there were hundreds of items of interest to model-makers and light machinery builders, from the tiniest of screws, springs, tubes, wires, and similar material, to workshop equipment of all kinds and small-power generating plant. If one-tenth part of the exhibitors on this occasion used the advertising pages of THE MODEL ENGINEER, there would be very little need for letters to the Editor to enquire where to buy special tools and materials. I do not suppose I saw all the exhibits by a long way during my one-day visit, but I was glad to notice a very excellent display of small house-lighting and pumping plants by our Henley friends, Stuart Turner, Ltd. I may perhaps say that THE MODEL ENGINEER also made its appearance in company with other well-known technical journals on one of the publication stands. One gets various impressions from a visit to an exhibition of this kind. For instance, it is impossible not to be fired with a new enthusiasm for British industry, when one sees how almost every conceivable branch of engineering manufacture is represented by goods of first-class design and quality. I feel rather humbled myself to find that there are so many firms and productions on the market of whose existence I have never previously heard. My pride is, however, somewhat restored when I reflect that this ignorance is not really my own fault. The responsibility rests mainly upon the unknown firms themselves for hiding their light under a bushel for so long. H.R.H. the Prince of Wales, in his fine speech at the Industries Fair Banquet at the Mansion House, suggested that British salesmanship needed some improvement. One most helpful factor in selling goods is advertising and more advertising of British goods to the world at large is badly needed. The showing of goods at the Industries Fair is in itself an excellent form of advertisement, but this does not go far enough. There are

hundreds of thousands of buyers who do not go to the Fair who must be reached by other methods of advertising if the story of British industry is to be adequately told.

Percy Marshall

STEAM STORAGE.

Dr. E. G. Ritchie, lecturing to the Junior Institution of Engineers on "Steam Storage," said it was a fact seldom appreciated that in the majority of industrial processes the first twenty-odd days of the month were entirely absorbed in overtaking the cost of production and, generally speaking, it was only in the last four or five days that profit was registered.

Viewed from this standpoint, increased production became a matter of the utmost importance since, by crowding into a month the equivalent of one or two additional days, the economic balance-sheet might be considerably affected!

In all manufacturing industries the final product represented a chain of processes and the productive efficiency of the plant as a whole was, therefore, largely dependent on the efficiency of the individual departments, and the satisfactory co-operation of the various processes in the long sequence.

Every manufacturing process suffered from a "bottle-neck" somewhere or other; it might be in the boiler house, in the steam distribution system, at some intermediate stage in the process of manufacture or in the transport and handling of the raw material or the finished product.

Discussing the importance of fluctuating steam pressure in this connection, Dr. Ritchie said that a boiler equipment could never meet "peak load" conditions without loss of steam pressure, the load factor on the plant would be 50 per cent. and the full capacity of the steam-raising units would only be utilised for an extremely short period of time throughout the working day.

But with a combination of boiler equipment and a steam accumulator, the time rate of steam demand could adequately be met and all "peak loads" could be covered with energy which was instantaneously available.

Giving examples of the advantage of the steam accumulator, Dr. Ritchie said that in a sugar refinery which he had recently investigated, steam pressure fluctuations were responsible for reducing the output of the refinery by not less than 15 per cent. With the installation of an accumulator these pressure fluctuations would be entirely eliminated, with a gain in output of the order indicated. Apart from this, the saving in fuel and boiler operating and maintenance costs alone would be sufficient to pay off the capital cost of the accumulator installation in the course of about 18 months.

THE "LIVERPOLITAN" PETROL ENGINE DESIGN MATERIALISES.

In the issues of THE MODEL ENGINEER for September 1 and 8, 1927, there was described an engine design which had been prepared to suit the requirements of a correspondent named "Liverpolitian."

The engine was required for the purpose of propelling a model motorship, and had to conform to certain conditions, not the least exacting of which was that difficult or complicated pattern-making had to be ruled out, and that, where possible, "component parts" which could readily be obtained ready-made or in the rough had to be used.

In respect of the latter, it was found that there were very few standard parts which could be worked in, and in order to solve the pattern-making problem it was decided to design the engine so that it could be made either with very few and simple castings or entirely from the solid by cutting and building up (brazing and soldering). The only component worth mentioning which could be obtained ready-made was the crankshaft, and even so the use of a stock shaft made it necessary to arrange for the attachment of balance weights.

I have no information as to whether "Liverpolitian" ever made use of the design or built an engine at all for his motorship, but the design has been built into a very successful engine by another reader, Mr. W. G. Butcher, who required a power plant for driving a small dynamo.

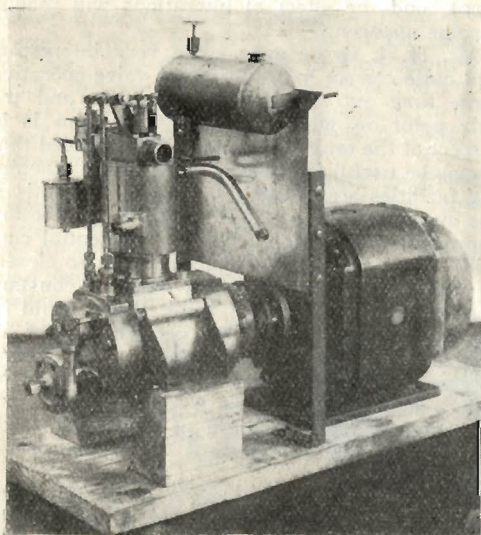
As with nearly every engine design I have ever been acquainted with, there were one or two slight modifications found desirable when it came to actually building the engine, and in these details the builder used his own discretion. The actual building of the engine was completed in a very short space of time, and I was very surprised to hear from Mr. Butcher that he had the engine ready and would send it for me to inspect if I so wished.

I certainly did wish, and in a few days it came to hand. The first thing I did was to dismantle it to examine the interior detail. This passed out with flying colours; the workmanship of the essential moving parts was remarkably good, and the fit and accuracy all that could be desired. The crankshaft was cut from solid cast steel (stout fellow!), the connecting-rod was also made from the solid and a piston made from "Specialloid" piston alloy was fitted.

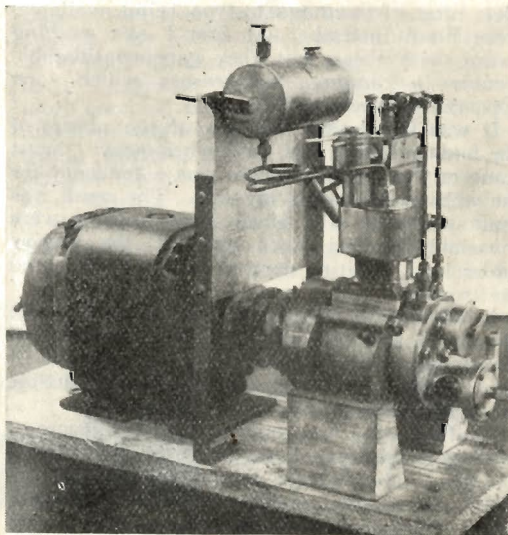
The only attention required inside the engine was to enlarge the lubricating holes in the big-end and to fit wire keeps to the big-end bolts.

The timing gear was correct except for the fact that the shape of the cam and followers was open to some improvement, which was carried out later on. Some notes on this important matter are given below.

In the matter of exterior detail, there were some indications of the finishing touches being somewhat hurried at the expense of good workmanship. The finish was good—too good for a



Exhaust Side.



Carburettor Side.

Mr. W. G. Butcher's "Liverpolitian" Type Petrol Engine.

representative appearance—and some of the parts, including the water jacket, had been nickelled, but a critical observer, looking only at the outside, would have formed a totally erroneous impression as to the general workmanship.

This tendency to scamp the tail end of a job is a very human one, and I must confess that when I get near the finish of an interesting model I am consumed with an almost irresistible desire to rush things in order to see it completed.

The ignition contact-breaker, water circulating pump and carburettor need no comment, as they were all essentially as shown in the drawings.

In the case of the carburettor, it will be noted that both automatic and hand control of the extra air valve were shown as alternatives. Mr. Butcher used hand control, but I would like to put it on record that in my experience with a carburettor of this type I have found that the automatic type of valve, once properly adjusted, gives better results—however, everyone to his taste.

Two features where departure has been made from the original specification have been the cause of a certain amount of trouble. The first is the valve guides. These were shown as machined from the solid steel valve pocket. This involved making a special tool, as it could hardly be reached by an ordinary boring tool, so a modification was made by screwing in the guides. It is extremely difficult to ensure a thread of this size pulling up dead true, and as a consequence some trouble was experienced in getting the valves to seat truly.

The other spot of bother was due to the main shaft ball races. These were specified as heavy duty single-row bearings, but a pair of complete races of the magneto type, being available, were fitted instead. At first I saw nothing wrong with these, but they gave considerable trouble in running, for reasons which soon appeared on investigation.

It was found that they are of the nature of cup-and-cone bearings, and when heavy thrust came on the crankpin there was a tendency for the webs to be sprung inwards. The result was that symptoms of a slack main bearing were invariably noticed when running the engine under load. Fitting correct pattern races cured the trouble.

I intended to run the engine up on a brake test, and find out what it was capable of doing, but owing to the very large amount of other work on hand at the time I was unable to carry this plan into execution.

As the engine was required for the purpose of driving a dynamo, I suggested certain alterations to render it more suitable for the purpose, which have been carried out by Mr. Butcher since the accompanying photographs were taken.

The water pump has been removed, and in its

place a centrifugal governor of the type described on January 3 last has been fitted. The carburettor, being unsuited to governor control, has been replaced by one of the type described on November 15 last. Both these features give excellent results, the only fly in the ointment being that the connections between the governor and the throttle are necessarily complicated, by reason of their relative positions.

Some trouble has been experienced with ignition: my own experience with the ready-made $\frac{3}{8}$ -in. sparking plugs having been repeated. Mr. Butcher has since made some plugs with "Steatite" insulators, similar to those I have described in my articles, with much better results.

The specified speed is easily reached under load, and much higher speeds are possible, but not to be recommended owing to the risk of the attached balance weights parting company with the crank. No figures are available as to the maximum power developed, but at quite a small throttle opening a 70-watt dynamo may be run up to full capacity. The 150-watt dynamo shown in the photographs coupled to the engine has proved unsuitable for direct coupling to the engine by reason of the fact that it is intended to run at a much lower speed than that at which the engine runs efficiently.

With reference to the valve operation, I would point out to intending engine builders the importance of plotting out the effect of variously shaped cams and followers, more particularly where one cam operates both valves, as in this case. To avoid complicated work on the drawing board, I have advocated, and myself used, cardboard models, which can be quickly cut out and altered. The lift of the follower should be noted against the angle through which the cam turns, and the effect of alterations will readily become apparent.

Mr. H. J. Grose gave some very interesting and quite correct information on valve operation some time ago (September 13 last), and the only point on which I differ from him is in respect of the tangential cam. He conceded that it may be useful for general work where machining facilities are limited; I contend that this is the normal state of affairs where models are concerned. The lift curve of a tangential cam with a suitable follower approximates so closely to that of a very carefully-made "constant acceleration" cam that I think there would be hardly any difference in the performance of an engine with either cam fitted. The inertia forces in model engines are so small—in the valve-operating gear, that is—that many considerations in the shaping of cams for large engines become unimportant when the size is reduced.

Mr. Butcher's engine has a tangential cam, and I do not think there is much fault to be found in its operation, to judge by the "super-sports" bark of its engine. It may be men-

tioned, however, that it was found desirable to fit light return springs to the cam followers to ensure their quick return at high speed.

I should like to assure the eminent speed-boat man who informed me quite definitely that the cam gear as drawn could not possibly work, that it does work—quite nicely!

To anyone wishing to build a similar engine, I should recommend some modifications, but a lot would depend on what work the engine would be required to perform. The use of a crankshaft with either solid balance weights, or provision made for resisting heavy shearing stresses in the attachment, would allow much higher speeds to be safely used. Greater maximum efficiency could be attained by a combustion head of domed shape with the valves inclined, but that would not be easy to arrange with the form of construction adopted. The straight-through carburettor as now used by Mr. Butcher is better for high speed than the original one.

As a speed boat engine, the weight is rather against it, but it would stand considerable cut-

ting down with no disadvantage, and as it is well on the large side the entire engine could be scaled down by about one-fifth, which would bring the bore down to just under $1\frac{1}{4}$ ins. The shafts could well be drilled for lightness, and also lubrication, which latter point would be of some importance if a continuous high speed is required. Some advantage would be likely to result from using a built-up crankshaft and doing away with the split big-end.

It is probable that at extreme performance there might be fairly heavy wear on the valve gear, but actual failure is unlikely. The gears should be of steel, case-hardened; on no account must "stock" brass gear wheels be used. It is rather unfortunate that steel gear wheels in small sizes cannot be obtained ready made (so far as I know) from any of the firms supplying model accessories.

In conclusion, I would like to congratulate Mr. Butcher on the workmanlike job he has made from the design. It may be noted that his engine was entered in the 1928 MODEL ENGINEER Exhibition, where it was highly commended.

JOBS FROM A COUNTRY WORKSHOP.

VI—Traction Engine, Tractors, etc.

By "Corinium."

There is little need to feel bored by repetition work in the country shop, nearly every job differs from the others. A customer comes along with a steel bar and some broken parts. "This is a suspension bar from the springs of my traction engine, you see it's broken." "I've brought along part of a plough to make a new one." This is typical of some of the requests we get. The part is a bar of steel about 3 ft. long and $1\frac{1}{2}$ ins. diameter, while the broken parts were originally a bar $1\frac{1}{2}$ ins. 2 ft. 6 ins. long and screwed seven threads per inch for about 6 ins. at each end.

A simple job, but the customer, in trying to help, was really hindering. The old bar required cutting off, carefully centring, and then had to be turned all over and screwed. If new stuff had been used a piece of bright drawn steel the correct diameter would have been cut off, one end held in the chuck and the other end in the three-point steady with sufficient projecting for the screw. Reversed to screw the other end. No centring or turning of centre portion required. Strange to say, three of these bars gave out

one after the other within quite a short time, all on one side of the engine. I have now made one of stouter diameter and bored out and screwed the buckle through which it passes, so we hope for better luck now.

The driver of this engine was an old chap who took a very lively interest in his charge. He kept it very clean and watched over it with quite maternal care. It is a treat to come across such a case, as, unfortunately, the reverse is more common to-day. The engine developed a knock at one end of the stroke (it is a compound working on one crank only), and this worried the driver, who thought it must be a loose bearing somewhere, probably the big-end of the connecting-rod. I was asked to inspect and run over all the bearings, which appeared

to be in order, so asked to have the valve-chest opened. Taking the cover off is rather a different job to the same operation on a model. The cover weighs close on a cwt. and is held in place by about twenty hefty studs and nuts. However, we took it off and had a look at the valves. As I suspected, the setting had at some time been

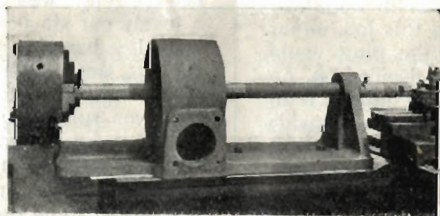
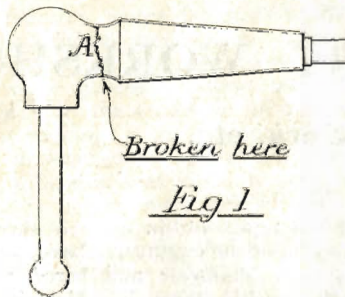


Fig. 7.—Boring a 2-ft. 6-in. Long Casting mounted direct on Lathe Bed.

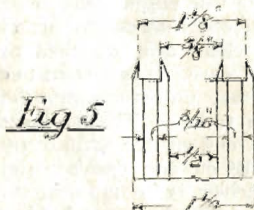
disturbed, and had been replaced incorrectly. So we set the valves anew and cured the trouble, to the delight of the old driver.

Another customer (a farmer's son) brought in the reversing gear of a traction engine to have the pins renewed. He is rather a particular chap and objected to a little noise from the gear, although the pins were not really bad. So new ones had to be provided. First the pin holes were ground out (they were all hardened) and new pins made to fit. As these were $\frac{3}{4}$ in. diameter by 3 ins. to 6 ins. long and $1\frac{1}{4}$ ins. diameter over the heads, it meant a fair amount of turning. They were made of mild steel, case-hardened and ground after hardening. No need to describe this; see last article.

A rather interesting small job in this connection was a plug-tap which required repair. This was off a very old traction engine and was used to control steam supply to the pressure gauge. Fig. 1 shows the idea. The original plug had been broken off at A close to the body. A plug was found which had seen service in some other capacity, but was nearly right to replace



Repairing a Plug Cook.



Tool for Cutting Leather Washers.

the old broken one. The taper of the plug was somewhat more gradual than that in the cock. There were two ways of tackling this job, either the body could be re-bored or the plug could be turned. The latter course was decided on, on the principle that it is easier to turn outside than inside. The first necessity was to provide centres as the shape of the head rendered it difficult to hold in a chuck. The remnant of a centre was present at the tail end and this was carefully drilled out to ride on the tailstock centre. To get a centre on the head of the plug a piece of hard wood was chucked and

bored taper by trial and error to fit the plug right up to the end of the taper. The plug was then gently tapped into the bored hole and a centre marked with a suitable tool, with the lathe running. A centre drill held in chuck on back centre completed the job.

Just one word about starting a drill true under the above conditions. After having dug out a centre, the drill on occasions refuses to run truly. This can be observed by noting if there is any movement of the drill. If the start is not true the point of the drill will wobble.

Remedy: bring a slide-rest tool up against the drill as near the point as possible and, while gently advancing the drill, press the tool against it. If carefully done this will centre the drill perfectly. The above does not, of course, apply if the drill has penetrated the full depth of the cutting lips. To resume, the plug is now ready to be placed between centres. Set the top-slide over by observation and take a trial cut (only a little one), and try in the plug. Proceed till correct, altering the slide-rest as required.

I mentioned previously the white-metalling of a half brass for a farm implement. This was rather an interesting little job so here's the description.

The brass was 8 ins. long and $1\frac{1}{4}$ ins. in the bore. Only one brass was used because the pull of the shaft was in one direction always, the remainder of the bearing was composed of the cast-iron housing. Two end plates were made of steel about 16-gauge, and a core of hardwood turned up just slightly shorter than the brass and faced on each end. The end plates were then placed against the end of the brass and screwed through into the core.

As the ends of the brass were faced and at the edge were unworn, the end plates fitted perfectly and no plaster stopping was considered necessary. The metal was now heated, also the brass, and poured. When cool the end plates were unscrewed and the core came away leaving a nice coating of whitemetal apparently without a flaw.

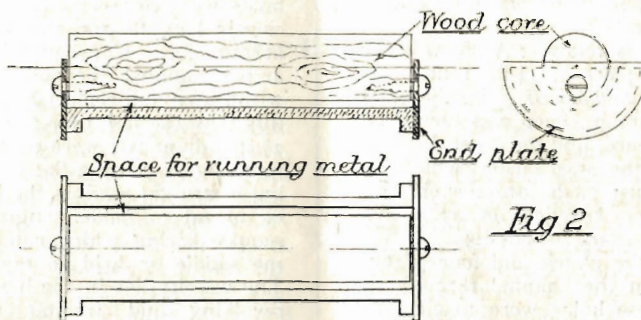
Now to bore it. The brass was mounted in vee blocks packed upon the lathe saddle. In order that the bore should be exactly a half circle, the edges of the brass were set by scribing-block at exactly lathe centre height. A boring-bar was mounted between centres and a sharp tool prepared to go in the bar. When all was set up, a cut was tried and the tool scooped out a lovely cut all along the brass. This was continued, advancing the tool in the bar to put on the cut, until sufficient had been removed. The result was a capital job. To radius the ends a tool was suitably ground and carefully brought into cut by advancing the saddle against it. Fig. 3 is a diagram of the setting.

We get some strange requests at times. I was asked some time ago to make a silk winder for a draper of this town. He told me what he wanted and left me to design and make the

machine. It's out of date now, I believe, since the ladies have dropped the craze for knitting silk jumpers. The machine did the trick all right, winding the silk from the hank on to wooden spools like giant cotton reels. I made him dozens of these spools, too, but I expect they have been used as firewood long since.

Jewellers, too, sometimes make use of the shop. One recently required some polishing and

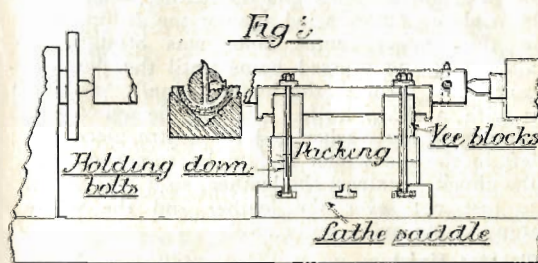
former bored slightly taper to take the outside diameter of the bottle top. Now, thought I, if I gently drive the top into the former, I may compress it sufficiently to enable it to catch the threads. Have a look at Fig. 4, and you may see what I mean. So I tapped it in, and it wouldn't come out! In trying to get it out, I hit the end of the top clean off. It came eventually, and I found the threads would hold



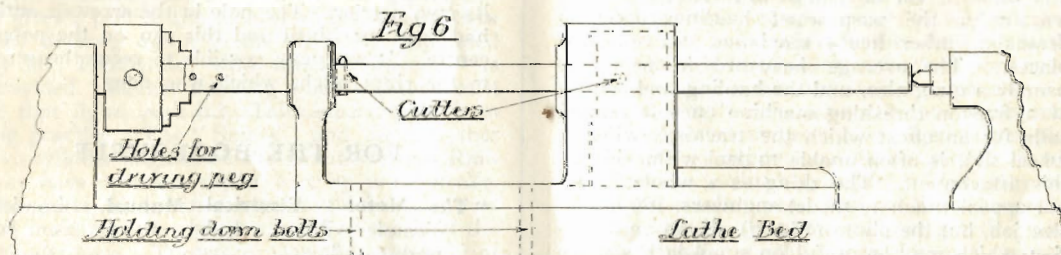
White Metalling a Half-Brass.



A Screw Stopper Repair.



Boring a Half-Brass.



Rig Up for Boring a large Job.

buffing machines fixed up. He had procured an electric motor and we fixed him up with a couple of grinding heads for his polishing, etc. The same gentleman sent me the other week a valuable scent bottle with a screw top. I don't know where the value was, it appeared to me to be worth only a few pence. The screw top was much worn and wouldn't screw, consequently it came off at the wrong time. I had a shot at it with indifferent success. I made a hardwood

nicely, but what good was that when the top was gone. So up to the jeweller I went, expecting ruinations, but to my astonishment he was pleased. "My jeweller will soon put a new top on," says he, so all's well that ends well.

While I have been writing these notes a rather interesting job has cropped up. It is for our local power station. A large six-cylinder crude-oil engine of 100 h.p. drives direct on to a dynamo through a more or less flexible

coupling. This coupling consists of a plate carrying studs $\frac{1}{4}$ in. diameter. On these studs are steel bushes $1\frac{1}{2}$ ins. outside diameter which register with holes in the other coupling plate. This coupling is accused of making an abnormal noise due presumably to wear, and the engineer has conceived the idea that the substitution of leather for the steel bushes may cure the trouble. Consequently, I was requested to cut a number of leather washers, $\frac{1}{4}$ -in. bore, $1\frac{1}{2}$ ins. outside and $3/16$ th in. thick.

The job was done as follows: A die was prepared as Fig. 5. A piece of $1\frac{1}{4}$ -in. round steel was chucked, faced, and bored $\frac{1}{2}$ in. diameter. Then a channel $3/16$ th in. deep was turned the inner diameter $\frac{1}{4}$ in. bore, and the outer diameter $1\frac{1}{2}$ ins. full, so that the steel bushes which had been in use would just push into the channel. The edges were then bevelled off as shown, leaving the edges as sharp as possible. It was then removed from the chuck and four $3/16$ -in. holes drilled from the channel through the piece endways. These holes were to eject the washer should it be completely severed and remain in the channel. The die was then replaced in the chuck and the leather, supported by a piece of handwood against the drilling pad in the poppet centre hole, was brought up against it and pressed home until the die was practically through the leather, finally severing it with a sharp knife. If the die penetrated completely the washer and the centre piece was left in the die which had to be removed from the chuck to extract the leather, so it was aimed to just not sever the leather and the whole thing came away quite easily.

Tractor Hoist.

My time has intermittently been occupied for the last three months with the design and construction of a hoist to attach to a farm tractor for the purpose of hauling threshing drums or other heavy machines out of bad places. The average farmyard in winter is usually a quagmire, and the hauling and setting of a five-ton threshing machine on soft ground calls for an effort which the tractor, owing to wheel slip, is often unable to deal with. Hence this attachment. The thing as a whole would not appeal much to model engineers; it's a full-size job, but the photo (Fig. 7) shows an operation which may be useful on small lathes when tackling a similar job which is actually too big for the tool.

The casting shown is about 2 ft. 6 ins. long, and the height from the base to the holes being bored was 6 ins. Now, my lathe is 6-in. centres, so there was no chance of putting the job on the saddle. It was therefore bolted direct on the lathe bed, and bored with a boring-bar, using the back poppet and its screw to provide the feed. A bar as stout as the cored holes would allow was prepared and provision made to place the tool in either of two positions along the bar. One end of the bar was supported on the back

centre and the other end lightly gripped in the three-jaw chuck using the "drill" jaws. It was gripped just sufficiently tight to prevent shake, but not so tightly as to prevent it sliding through the jaws under the pressure of the poppet-head screw. To carry the bar round, two holes were drilled in the bar so that a kind of tommy could be pushed in which would catch the chuck jaws and carry it round. The two holes were necessary as the jaws were insufficiently long to give the necessary lateral travel at one go. Consequently, when the tommy arrived against the body of the chuck, it was withdrawn and replaced in the second hole. In this way the holes for the main bearing bushes, $2\frac{1}{2}$ ins. diameter, were bored and also the bosses faced up by using a flat tool in the bar and feeding it straight against the boss. This trick may be useful to model engineers when castings require boring which can neither be placed on the saddle or held in the chuck or faceplate. The novelty lies in the method used of holding, revolving and feeding the boring-bar (see Fig. 6).

Some of the simplest looking jobs cause the most trouble. A couple of beer taps with the outlet arranged to take a hose connection have just been through the shop. The hose connection appeared to have a thread of 9 per inch, while the tap makers sent taps threaded 11 per inch. Sounds simple, doesn't it, but did you ever try to chuck a tap of this description? It's one of the most awkward jobs under the sun. It was eventually managed by holding the screwed outlet in the self-centring chuck and by bringing up the poppet centre against the opposite side of the tap. A mark was made sufficiently clear to enable a centre to be drilled. This having been done the tap was placed between centres, the body of the tap forming its own carrier. The hole in the screwed outlet had been machined and this ran on the poppet centre. It was now possible to recut the screw to the right pitch, which was done.

FOR THE BOOKSHELF.

"The Motor" Electrical Manual. London: Temple Press, Ltd. Price 2s. 6d., postage 3d.

The fourth edition of this now well-known handbook has been revised and re-illustrated. It contains 168 pages which deal with electrical principles and elementary theory, ignition systems, magnetos of all types, coil ignition, sparking plugs. The treatment of lighting and starting equipment comprises detailed descriptions of dynamos, batteries, cut-outs, starters, dyna-motors, switch-boxes, wiring, lamps, instruments. Electrical accessories, labour-saving electrical devices for garages are dealt with, and a glossary of electrical terms is included.

SHOPS SHED & ROAD

A Column of "Live Steam."

By "L.B.S.C."

Port Areas—a Comparison.

It is a well-known fact that if anybody concentrates on one particular job or class of work, they are very apt to overlook or ignore obvious facts and circumstances connected with other branches of the same work. This point is very well illustrated by the letter from Mr. G. S. Willoughby, on page 115, January 31 issue. Mr. Willoughby does not actually suggest that "Fayette" is over ported, but hints at it, and bases his remarks and observations on the old "slow-and-easy" No. 1 which he is at present rebuilding, apparently forgetting all about the modern locomotive with its piston-valve cylinders and huge annular ports. These, of course, far exceed in area anything ever attempted with flat ports. Suppose we do a little analysing. Had "Fayette" been built for my own use, she would have had piston-valves. A full-size locomotive of her type would have valves of 9 or 10 in. diameter, and "Fay's" would have been, say, $\frac{3}{4}$ in.; I don't think Mr. Willoughby would consider a $\frac{3}{4}$ -in. diameter valve an excessive size for a cylinder of 13/16th-in. bore. The steam and exhaust ports would, of course, be cut right around the liner or bushing in which the piston-valve operates; and if this were "flattened out," it gives a port length of over 1 $\frac{1}{2}$ ins.—*more than half as long again* as the big ports, stipulated by Mr. FitzGerald, with which "Fayette" is provided. Rather startling when you look at it in that light, isn't it? Take an example from big practice. The "Saints" and certain other two-cylinder engines on the Great Western Railway have cylinders 18 $\frac{1}{2}$ -in. bore by 30-in. stroke. The ports, if flattened out, would be just over 3 $\frac{1}{2}$ ins. long; roughly one and two-thirds of the cylinder bore. Therefore, viewed in the light of modern G.W. practice—and nobody will deny the efficiency of the Great Western engines—"Fayette's" ports could not be considered over-size unless they exceeded a length of 1 $\frac{1}{2}$ ins.!

How Big Ports Affect Working.

Mr. Willoughby lays stress on the clearance losses. It is quite true the ports and passages have to be filled with live steam at each stroke, but that is unavoidable, and I always minimise it as far as possible by cutting down piston clearance. It is, however, a great mistake to assert that big ports and passages cause sluggish movement of the steam. Actually, the reverse

is the case, and, if Mr. Willoughby had heard "Fay" puff he would have hesitated before making that remark. Even when moving slowly, throttled down so that the beats are scarcely audible, each one is a distinct, sharp snap, with no sign of a hiss or other indication of sluggishness. I certainly cannot follow his reasoning that a drop in pressure on the pistons is the result of big ports. Whatever the size of the ports, the cylinder will take the same volume of steam at a given pressure to fill it; and the larger the port, within reason, the sooner will the steam get to its job and put forward its full energy. Anyway, the proof of the pudding is in the eating, and regarding actual efficiency (amount of work done for coal and water consumed) "Fayette" is the best engine I have yet built. Of course, the Baker valve gear has a lot to do with that. This gear, with its freedom from die-slip, backlash and other link-gear evils, and its quick valve movement, puts it in the front rank of locomotive valve gears, but unless the ports are large a great deal of its advantage would be nullified. When an engine is running notched up, with a fair amount of regulator opening, the pressure in the steam-chest is not very far below that in the boiler. Just a whiff of high-pressure steam is needed at each end of the stroke to keep her on the run, and as the valve will only be showing a crack of port opening, it stands to reason that the port must be of adequate length, otherwise sufficient steam may not be admitted to get the required power plus the benefit of expansion. Some good folk will no doubt be inclined to argue, "Well, why not keep the smaller port open a little longer?" The answer is, that you will not get the same initial pressure on the piston, for two reasons: one, the steam will take longer to travel through the smaller port and passage, and, what is more important, the piston will have started on its journey down the cylinder and will never receive the full initial pressure. Suppose you went to dot some guy on the nose, and he popped his head back just before you "make contact," he wouldn't feel it nearly so much as if he stood still and received the blow, or even came forward to meet it. Likewise, if you want to drive a nail into a wooden object, it is not the slightest use resting the hammer head on the nail and pressing it. You might push and push till black

in the face and get no result for energy expended; yet a few sharp taps does the trick. This is not very scientific, but it is truth, and I guess you will get my meaning if you just consider. Harking back to experiences in full-size practice, the Stroudley "D" class tanks on the old Brighton line could do their 60 m.p.h. with ease if they were put to it; but a larger type of engine, the Billinton radial tanks ("Bob's" design, not his son's) would never turn their wheels at an equal r.p.m., but would get to a certain speed and refuse to go any faster. The former engines had two sets of ports and a double slide valve to each cylinder; the exhaust was very free—not only did it escape up the blastpipe but some of it went back in the tanks to heat the feed water. The radials had single valves and blastpipe exhaust only. Steam could neither get in nor out of the cylinders with the ease and facility obtained on the little tanks, hence the poor results. They had fearful appetites for coal, and were invariably leaking like old boots.

Mr. Willoughby is correct in his remark that I have probably found very shallow valve cavities in repair jobs. I have opened many out, and got good results; but with long ports a very deep cavity is not required, and even with a "flat-and-slot" drive it is easy enough to get sufficient depth of cavity. "Fayette's" valves are buckle-driven, but any other drive allowing for, say, $\frac{1}{4}$ in. depth of cavity will do as well.

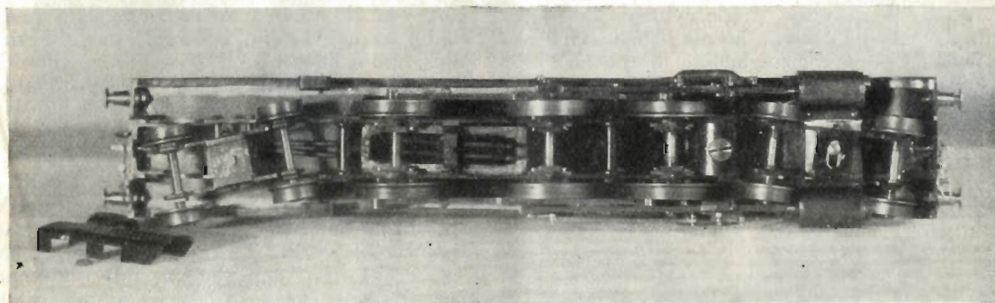
The Suggestion Competition.

As there are some suggestions in the above referring to locomotive work, maybe a little comment is excusable. I am afraid Mr. H. Price will be unlucky. The only "locomotive" which could be sold as a complete set of parts like a radio set and only wanted screw-driver and spanner to completely assemble, would be of the toy variety such as Messrs. Bassett-Lowke used to sell in days gone by. Our friend evidently hasn't a notion of the amount of work and number of parts required to put together a really good locomotive. Anyway, even if it were done, the cost would be practically the same as the finished engine. The assembling is nothing. It is in the making of parts where the time and labour is spent. With regard to Mr. Openshaw's request for working drawings of my engines, his wants will soon be supplied. Hamleys have had this matter under consideration for some time, and are now getting a move on. I have nothing whatever to do with it; they are taking all details from back notes. I might here mention that Mr. James A. Joslin, of Toronto, has got over his recent illness and been busy with his pencil again. As you who follow these notes will know, he was responsible for the outlines of both "Helen Long" and "Ursa Max." I supplied "Helen" with works, and built the first of her race. Mr. Hunt, of Toronto, put the "giblets" into "Ursa," and several are now

in hand in different parts of the world. Well, Mr. Joslin, who is about the finest draughtsman I know, has got out some more designs based on actual experience; and, all being well, details will soon be given in these notes, and blueprints will be on sale through the usual channels. I won't say too much now, but the "Royal Scot" class enlarged into a Pacific whilst retaining the familiar characteristics, will delight the supporters of the L.M.S.; and I wonder what on earth Mr. Collett will think of a Great Western Pacific with Baker valve gear! As to Mr. Priestley, his "want" is a step in the backward direction. We have suffered far too much in the past and wasted valuable time and money building engines from "paper designs to formula and data." If friend Priestley had seen the endless succession of engines "built to formula" (and turned out N.B.G.) which have been put right in the little N.L. shop alone, he would feel horror and repulsion at the idea of "designing" an engine without studying the results of actual experience. Anyone who wants to "step out on their own" need only make themselves familiar with the general proportions of any engine which has been a proved success; they can then go right ahead and build up a machine to any design or pattern which they fancy, using the knowledge gained. So long as they don't adopt any silly ratios, such as a cylinder $\frac{1}{4}$ -in. bore and $2\frac{1}{2}$ -in. stroke, driving a crankpin stuck in the balance weight of a 3-in. diameter driving wheel; or put the firebox on top of the boiler barrel; or fit square wheels and wooden springs, then all will be well. As to Mr. Lockington, judging by my correspondence, his is a "voice crying in the wilderness." Ninety-five per cent. of locomotive builders, or those interested if they do not build, have eyes only for Pacifics, Mountain types, caterpillars, and so forth. Mind you, I sympathise with him, having a very warm corner in my heart for the "old brigade" and hope to build for myself a "Gladstone" but with modernised "giblets" and a superheater boiler, just to see what she will do. But, except for "Caroline's" builder (Mr. Rodgers) and a very few others, brother loco men in general are inclined to shunt even a modern 4-4-0 like "Simple Sally" into a siding and forget all about her, when "Helen" or "Fayette" heaves in sight.

"Fayette" as a Multi-cylinder Job.

A train of circumstances which may or may not affect future "Live Steam" notes has taken me away from home most part of the week these notes were in hand, and I have not had time to work out my usual little sketches; so, brothers all, must beg your indulgence for cutting "Fay" details short. Make up for it next week, if all's well. Several correspondents have reminded me about giving promised dimensions for three or four cylinders. Well, I strongly advise anyone who has built a locomotive before, to put the



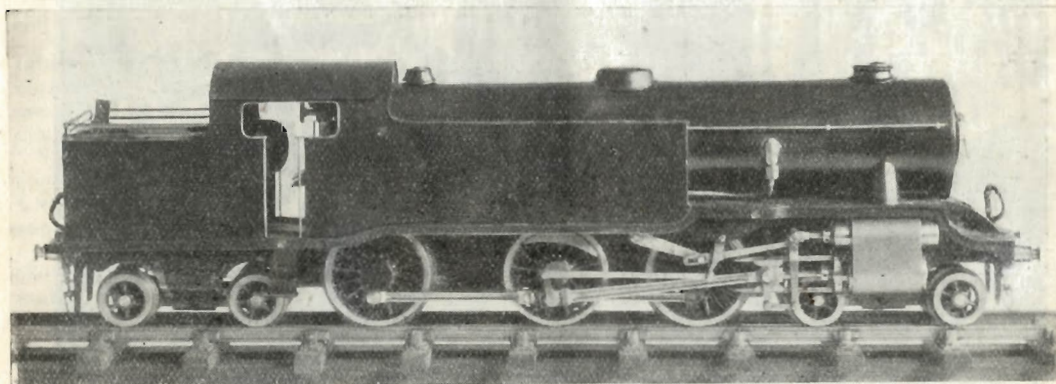
Underneath View of Mr. Atkins' Coal-fired Gauge 0 Locomotive.

extra cylinders in. Three cylinders of $11/16$ th-in. or even $3/4$ -in. bore may be used, or four $5/8$ -in., with as long a stroke as the wheel bosses will allow. By the way, several brothers have pointed out that the throw of the crankpins was not given when describing the wheels. That was true, as I believe several different pattern wheels are being sold and they have different sized bosses. The original "Fay" has $1\frac{1}{4}$ -in. stroke, but if your wheel castings will allow of a longer stroke than this, by all means adopt it. The cylinders will stand up to $1\frac{1}{4}$ -in. stroke easily. "Helen Long's" inside cylinder casting (Kennion) will do all right for "Fay," and it should be put as far forward as possible, in place of the drum-type lubricator on the two-cylinder job. A different system of lubrication will be given when we come to that part. The leading coupled axle must be replaced by a "Helen"-type crank, and a marine pattern connecting-rod will be found the most convenient on a small engine. The valve gear will probably cause a "spot of bother" and a few Parliamentary expressions. You cannot get a Baker set between the frames under the boiler, and the only alternative is to use two outside Baker sets and the two-to-one levers for the inside cylinder (real practice) or three sets of American

Southern gear. I prefer the three sets, as with two-to-one arrangement you have a sort of "fixed ignition," as our automobile friends would call it, on the inside cylinder; and to get absolutely correct timing, the usual procedure is reversed and the crank timed up to the valve. This throws out, slightly, the correct even crank spacing; but it is better to hear the engine throw off nice even beats, than worry about Inspector Meticulous and his crank measurements. The turning movement will be practically unaffected.

Four Cylinders.

This arrangement is far and away the best; balance is perfect as the inside and outside cranks are directly opposed, and two sets of Baker gear only are needed, the inside valves being operated by plain rockers through the frame. Inside cylinder as used on the caterpillar (castings from Kennion or Hamleys) will fit in nicely between the frames, and are placed well forward; the exact position does not matter so long as there is room to couple up the pipework. An ordinary two-crank axle replaces the plain leading coupled axle, with cranks at $\frac{1}{2}$ -in. centres. Will shortly give details how to make it, with sketch, as it will do also for a plain inside cylinder engine should anybody be making one. *Re cylinder machining:* mount the



Mr. Atkin's Gauge 0 Coal-fired Locomotive.

block on the angleplate with one bore lined up for operation as with the single cylinder; bore out and face the end right across; then slack off the bolts holding the angleplate to the faceplate, and without shifting the casting on the angleplate itself, slew the latter over bodily until the second bore is right for tooling, then bolt up. You will then find the bores will come exactly parallel. On "Fay" there will be plenty of metal in between; but in the case of a plain inside cylinder engine having big bores, they can be opened out until there is only $1/32$ nd-in. wall between the bores and it will be all right. Anybody who puts the four cylinders into "Fay" will be well repaid for their trouble; a "four" is just wonderful when carefully driven. The acceleration must be experienced to be fully appreciated. Mr. Kirk's "Vindictive" (four cylinder 4-6-2), which I built some five years

ago, was operating over the N.L. a few days since, and is as lively as a kitten. Has had no repairs except for an accident, has run many miles, and is lighter on coal and water now than when she first left the shops. The pistons have never had the packing touched, and there is no trace of a blow-by.

A Gauge 0 Baltic Tank.

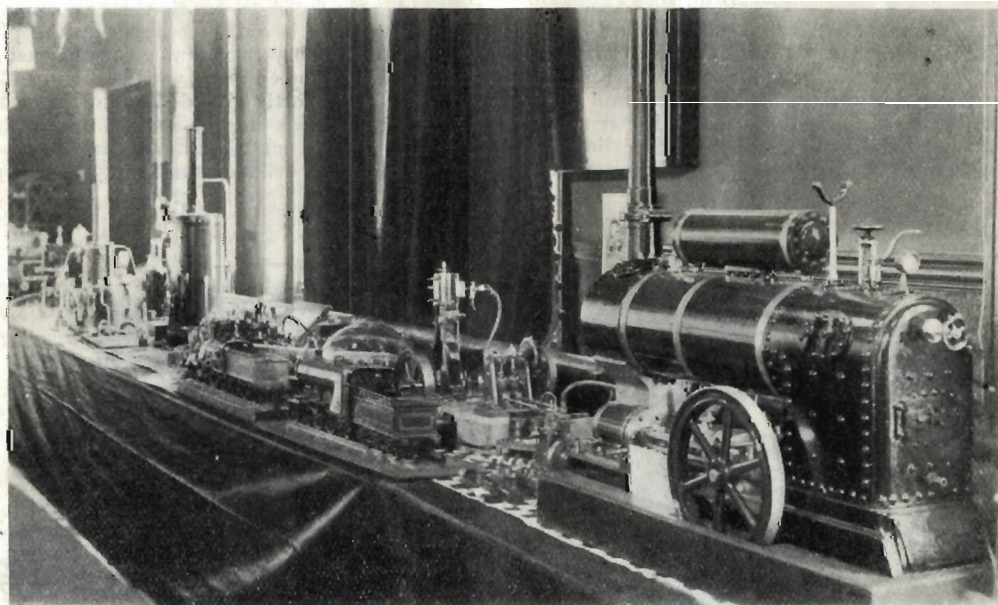
The photos show a locomotive built by Mr. Steadman Jackson for Mr. William Atkin, of Huntington, N.Y., U.S.A., and she is a very fine piece of work. The cylinders are the same as "Sir Morris," but she has full Walschaerts gear of the L.N.E. pattern. The lubricator is behind the cylinders. The boiler is coal-fired, widened out inside the tanks, fitted with a special type of firehole and a two-bar grate with dumping apparatus. The bunker tank carries water, which is fed to boiler by a lever hand pump.

MODEL-MAKING AT GRANTHAM.

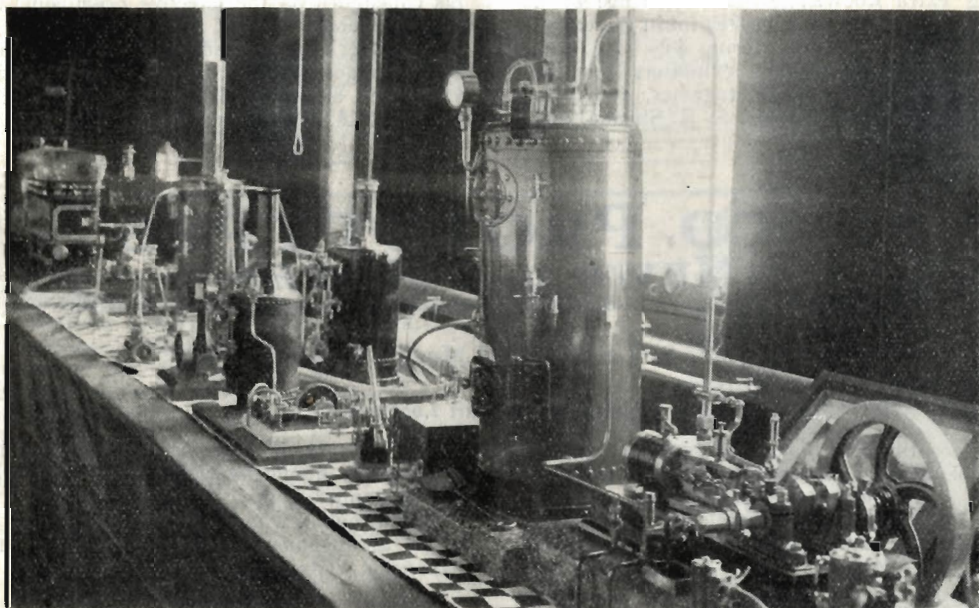
Model Engineering was very strongly represented at the first Arts and Crafts Exhibition held at the Co-operative Hall, Grantham, on February 14, 15 and 16. The exhibition was organised in connection with the Sports and Welfare Club associated with the well-known engineering firm of Messrs. Ruston & Hornsby, Ltd., of Grantham and Lincoln, and this year the entries were limited to the work of Grantham residents. In future years some of

the classes will probably be thrown open to the Midlands, or even to a wider area. But even with the present limitation, there was an excellent show of model engines, boats and technical drawings, as will be seen from the accompanying photographs.

Most of the models were shown running by compressed air. A petrol-paraffin engine driving an air compressor was rigged up in the adjoining yard, and a delivery pipe taken up into the exhi-



Some of the Models shown at the Recent—



—Exhibition of Arts and Crafts at the Co-operative Hall, Grantham.

bition hall. All the engineering models were arranged on one long bench, and at the back of this an air supply pipe was run throughout the length. From various suitably placed nozzles, rubber tubes conveyed the compressed air to the models and kept them running. An air pressure in the neighbourhood of 35 lbs. to the square inch was used.

The majority of the models were steam engines of the vertical or horizontal type, but there were one or two good locomotives, an anti-aircraft gun, a miniature motor-cycle, and a number of Meccano models. Of the latter, by far the most interesting was a working model of a Ruston Excavator shown loading and unloading sand. This clever model not only performed all the movements of the prototype very accurately, but did them at the same speed.

A section for trade exhibits added to the interest of the show, and indicated to coming enthusiasts where castings, tools and materials could be obtained. The firms represented included Messrs. Stuart Turner, Ltd., showing a "Stuart" gas engine, and "Stuart" steam engines and castings; Messrs. Bassett-Lowke, Ltd., showing model locomotives, railway supplies, and miniature ships; Messrs. Musgrave and Co., showing engineers' tools; and Messrs. Sheane Bros. & Co., Ltd., showing a new model-maker's combined lathe and drilling machine, which we shall describe more fully in a later issue. A number of local firms also exhibited photographic and arts and crafts supplies.

The opening ceremony took place at 4 o'clock on the Thursday afternoon. Mr. John Tinn,

O.B.E., the President of the Society, spoke of the objects of the exhibition and of the success which had attended the formation of the local model engineering society and model boat club. He then introduced Mr. A. R. Bellamy, the Chairman of Messrs. Ruston & Hornsby, Ltd., and asked him to declare the exhibition open. Mr. Bellamy said he was very pleased to take part in such an interesting gathering. It was really a revival of something which had been attempted before, for many years ago an exhibition of employees' work had been held, and Mr. Hornsby had given a medal for the best engineering model. He was glad to see such an excellent display of work on the present occasion, and hoped that it would lead to the development of both mechanical and artistic hobbies among the employees of the firm, and that it would become an increasingly successful annual event.

Mr. Percival Marshall then gave a short address on model-making, and expressed the good wishes of the model engineers and power boat men of London towards the new society at Grantham. He said that if he were an engineering employer looking out for a young man to undertake some experimental or research work or to fill some post where imagination and enthusiasm for engineering were specially required, he should always count it in an applicant's favour if he were a model engineer as well as being qualified in other ways. The fact that a young man chose to follow model engineering in his spare time showed not only that he was keen on his work, but that he was

gaining extra knowledge and experience of a kind which could not but be helpful in the carrying out of his real engineering job. He congratulated the Grantham exhibitors on the splendid show they had got together, and complimented the Secretary, Mr. S. R. Sheane, and

his colleagues on the effective organising work they had done.

A number of prizes and diplomas were awarded by the judges. These included MODEL ENGINEER silver and bronze medals, awarded respectively to Mr. H. A. Kirkby and Mr. H. Undy.

LOCO. PROTOTYPES NEWS and NOTES

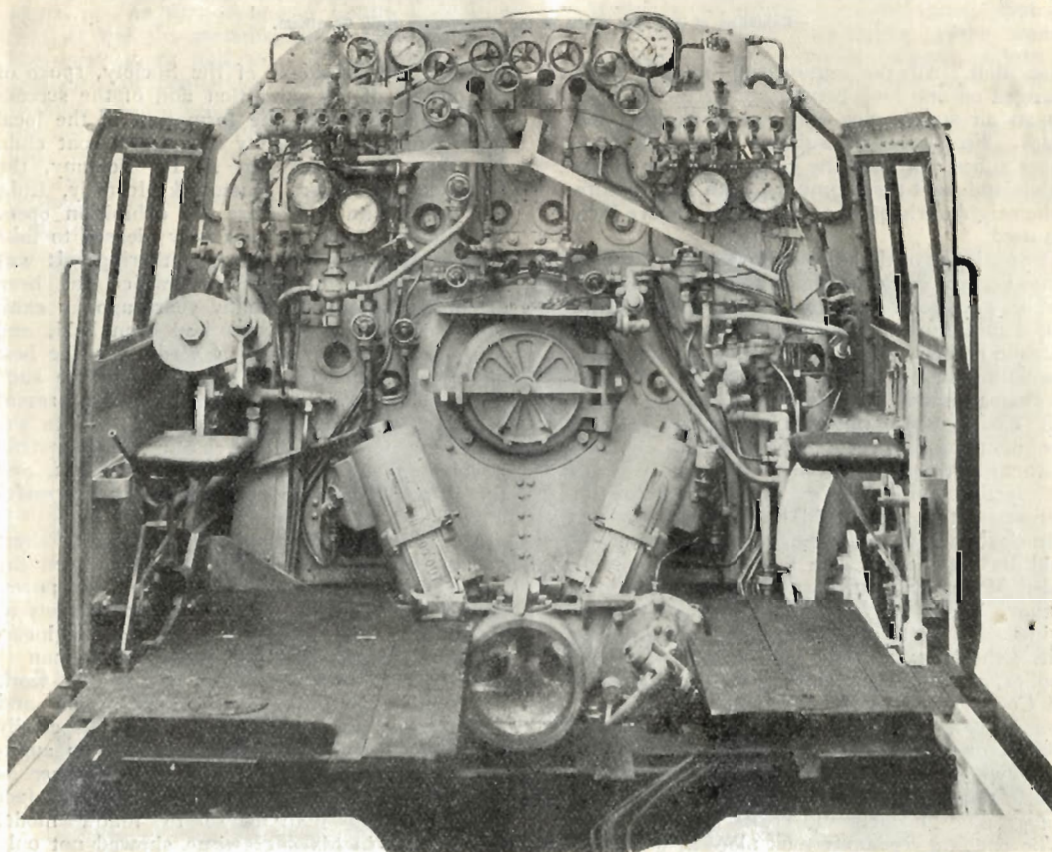
By Chas. S. Lake, A.M.I.Mech.E., M.Inst.L.E.

A Remarkable Garratt Locomotive.

Just recently there have been completed at the works of Beyer, Peacock & Co., Ltd., Manchester, three heavy and powerful six-cylinder Garratt locomotives for service on the New Zealand Government Railways, the gauge of which is 3 ft. 6 ins. One of these engines is,

by the courtesy of the builders, illustrated herewith, and is intended with the others for working fast passenger trains.

Each group of wheels, constituting the 4-6-2 wheel arrangement, is driven by three single-expansion cylinders, each measuring 16½ ins.



View of the Cab of the Garratt Locomotive before the Roof was Placed in Position.

diameter by 24-in. stroke, steam distribution being effected by Walschaerts gearing and piston valves above the cylinders. The Gresley arrangement is adopted for operating the inside valve by means of a cross-lever between the two outside valve spindles, and the arrangement is such that the valves work with a maximum cut-off of 50 per cent.

A very large boiler is provided, this having a total heating surface of 2,794 sq. ft., with grate area 58.3 sq. ft. The boiler pressure is 200 lbs. per sq. in., and the tractive force, at 75 per cent. of this, amounts to 51,580 lbs. The coupled wheels measure 4 ft. 9 ins. diameter, and the total wheelbase of the engine is 76 ft. 7½ ins.

A view of the cab interior and footplate arrangement, from a photograph taken before the roofing was placed in position, is also reproduced. This shows a portion of the duplex mechanical stoker used for firing and other details. The firebox is fitted with two Nicholson thermic syphons of the kind commonly employed on the United States Railways. Other equipment includes steam reversing gear and air sanding to the front and rear of each group of coupled wheels.

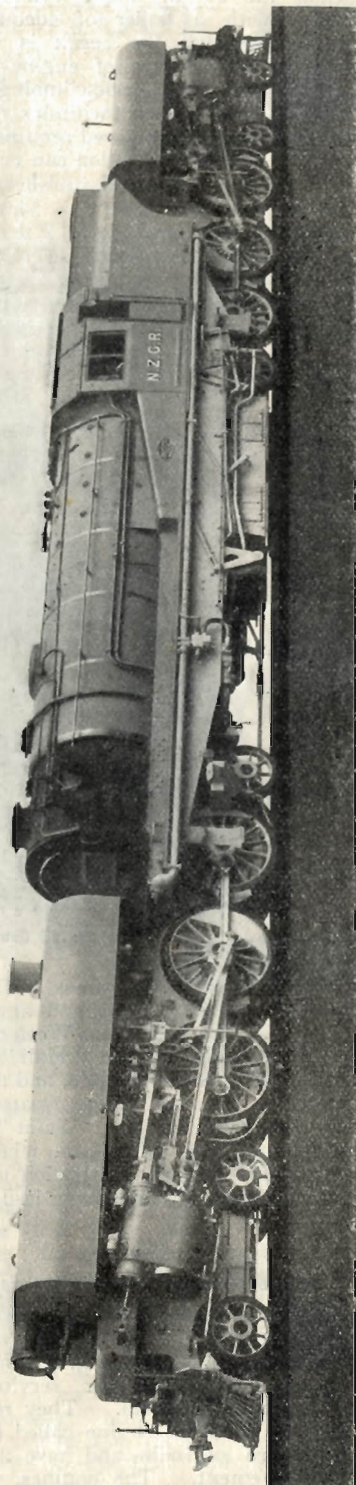
The coal capacity of the bunker is 6 tons, and the combined capacity of the water tanks 4,000 gallons.

The engines have been introduced for working heavy mail trains on the New Zealand Railways, and are designed for a sufficient power output to replace double heating and banking. The specification provided for the achievement of a speed of 50 m.p.h. on the level, and the negotiation of grades of 1 in 40. The engine weighs in working order 145½ tons.

The 4—4—0 Type Superseded.

An order has been placed at the Swindon works of the Great Western Railway for eighty 4—6—0 type locomotives having the same general characteristics as the well-known "Saint" class but with smaller wheels, and these engines are being specially constructed to meet requirements for which the 4—4—0 type of engine has ceased to be effective. The combination of a high boiler pressure, namely, 225 lbs. per sq. in. and coupled wheels 6 ft. diameter, results in providing a higher tractive effort than could conveniently be obtained with the 4—4—0 wheel arrangement. On this point it is only necessary perhaps to say that one of the principal reasons is that to obtain the same power output there would have to be a much heavier load on each axle than is considered advisable or safe at the present time.

The demands of traffic where passenger trains have to make frequent stops and yet maintain a relatively high average speed, makes it almost compulsory to resort to a third coupled axle, so that a sufficiency of adhesion weight can be secured without introducing any excessive individual axle loads. This in its turn makes

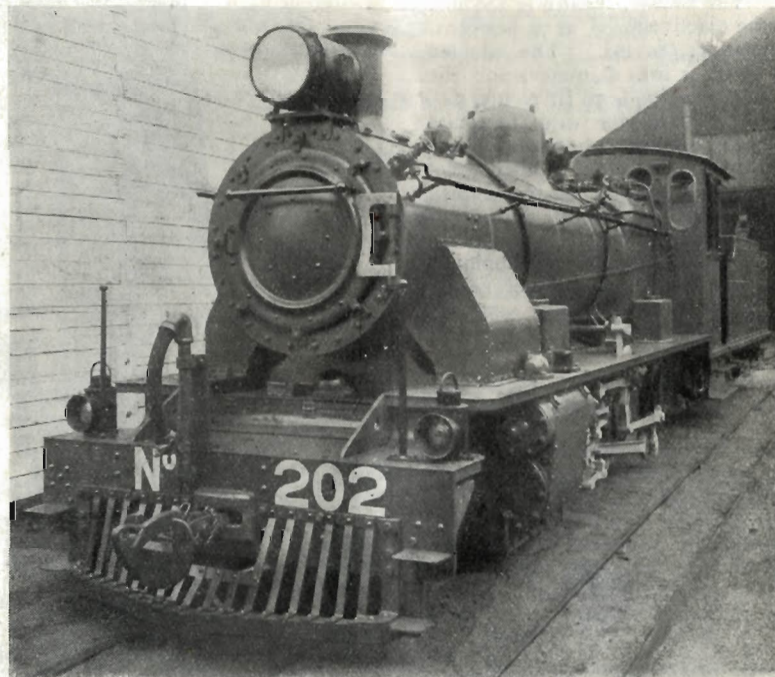


The Garratt 4—3—2—2—2—6—4 Locomotive for the New Zealand Government Railways. Gauge 3 ft. 6 ins.

practicable the use of ample cylinder proportions, and with a boiler of adequate steam generating capacity, the result is seen in a powerful yet simple type of engine possessing good accelerative and grade-climbing abilities, the employment of which facilitates the task of maintaining the average speed required.

An engine of this description can run at tolerably high speeds on the level, and keep going on

very nicely proportioned, are noteworthy for the somewhat elaborate equipment they carry, these including electric lighting for the head lamp and in the cab, the current being supplied by a "Sunbeam" generator. The engines are also fitted with Lambert wet sanding gear, Goodall articulated intermediate drawgear, and Wakefield A.C. lubricators. They have leading particulars as follows:—



Narrow Gauge (2 ft. 6 ins.) 2-8-2 Type Loco for India.

up-grades without undue stress owing to the moderate size of its wheels and amplitude of steam supply. The new Great Western engines, which will be known as the "Hall" class, are fitted with two outside cylinders, and the general characteristics are, as before stated, almost precisely the same as the "Saint" class of express engines with 6-ft. 8½-in. wheels. Further particulars and an illustration of the new class are reserved for the next issue of these notes.

New Narrow-Gauge Locomotive for India.

Whilst at the works of W. G. Bagnall, Ltd., Stafford, recently, the writer was enabled to inspect the first to be completed of some locomotives being built there for service on the 2-ft. 6-in. gauge in India. They represent a new type of standard engine called for by the Railway Board of India, and have the 2-8-2 wheel arrangement. The engines, which are

Cylinders, dia....	13 ins.
" piston stroke ...	18 ins.
Wheels, coupled, dia. ...	2 ft. 10 ins.
Wheelbase, coupled ...	6 ft. 7½ ins.
" total, engine ...	19 ft. 7½ ins.
" engine and tender ...	34 ft. 3½ ins.
Boiler, dia. inside front ring...	3 ft. 6 ins.
Length of boiler barrel ...	10 ft. 9 ins.
Firebox, length outside ...	4 ft. 10½ ins.
Heating surface—	
Tubes ...	521 sq. ft.
Firebox ...	66 sq. ft.
Superheater ...	125 sq. ft.
Total ...	712 sq. ft.
Grate area ...	14 sq. ft.
Boiler pressure ...	160 lbs. sq. in.

At 85 per cent. of the boiler pressure a tractive effort of 10,039 lbs. is developed. In working order the engine weighs 28½ tons, and the tender 16 tons, so that the total for engine and tender is 44.5 tons.

A BACK CUTTING-OFF TOOL FOR THE LATHE.

By H. Dyer.

The cutting-off tool herein described was made by the writer chiefly to enable him to turn out—or part off—the small screws shown in photo; enabling him to complete 37 per hour (at night). Being an odd size, they came out much cheaper than he could purchase them.

The cutting from solid eliminated pattern-making, and also any chance of blow-holes where inconvenient, e.g., in the locating rib in

This must be exactly a fit, and the same distance within a “thou” or two as the back edge of back T-slot is from back of boring table. Height must be, excluding locating key, same as centres above boring table or saddle. By varying these two measurements to suit individual requirements, the appliance can be faked to suit most small lathes.

In cutting from a piece of $1\frac{1}{4}$ -in. B.D.M.S.,

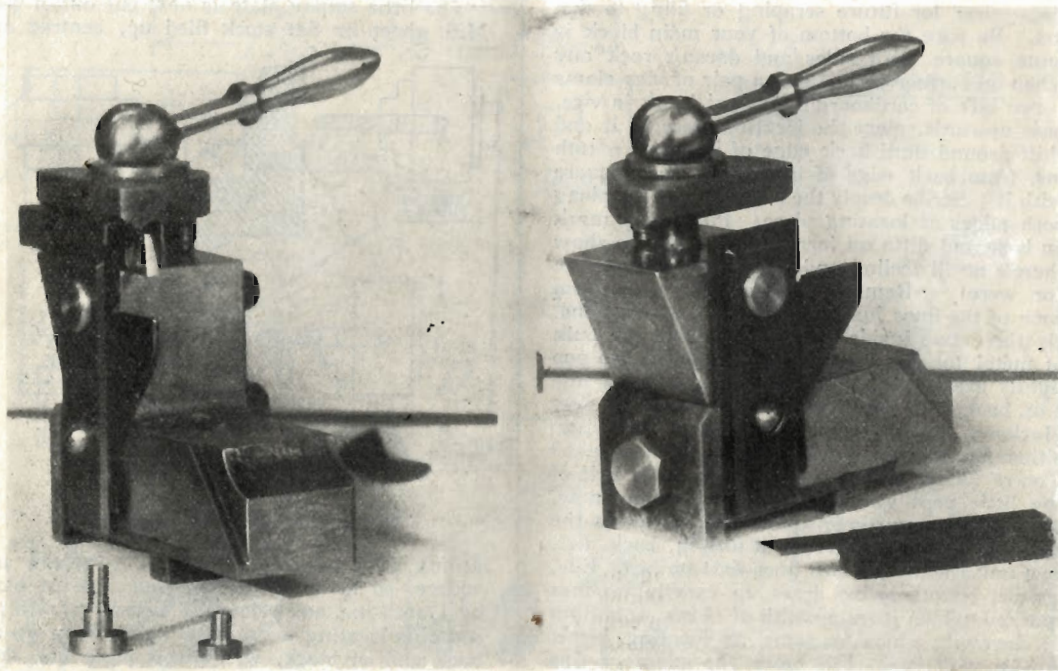


Photo by]

Two Views of the Back Cutting-off Accessory for the Lathe.

[Negus, Penzance.

base. Prospective makers can, if they wish, have a block cast and file up—*sans faire rien*! I possibly should have done so if a large “big-end” keep had not been spotted and purchased for a “tanner” at the local breakers.

Anyhow, to get on with the job. As previously stated in these pages, the writer possesses an Eta lathe, which, as owners know, is $2\frac{1}{2}$ ins. from saddle to centres; incidentally, the same as the width of the “keep” in question. The overall sizes don’t really matter a hang. What does matter is the distance from the inner or back edge of the locating key, feather or rib—whichever you like—to the back edge of block.

mark off as per sketch A, and with square mark off all round and pop lightly all lines to be cut. This doesn’t take many minutes, and it is well worth the little extra trouble. Clamp in vice and begin. By the way, either buy—or if the “missus” is out, pinch—a good big lump of lard to rub the saw in every two or three minutes. Readers of “ours” don’t want to be told how to use a hacksaw, of course, but in case this job begins to look as big as the vice when you start in on it, don’t get looking at it and wondering “how much longer.” Look at what you’ve got through, give the saw another rub in the lard, spit on your hands

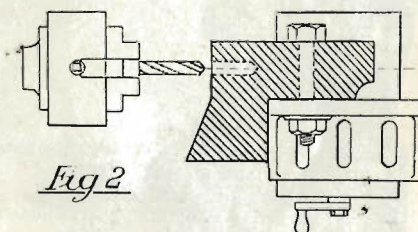
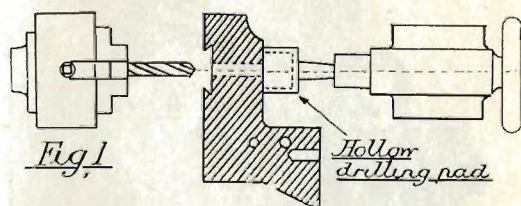
and got for it like — —; 50 to 55 a minute with a 12-in. frame and about 60 with an 8-in. or 9-in., and an hour or hour and a quarter'll see the ends on the deck. Trim up any lumps left by an erring saw—it's always the saw that's to blame—and file up to your pop marks, bags of chalk on your file, and don't be afraid of the file card either—use it!

Now we come to the locating piece—we'll leave the holes, etc., until later, and do all the sawing while the sawing's good. Dig round and find a piece of B.D.M.S., something near $1\frac{1}{4}$ ins. by $1\frac{1}{2}$ ins. by $\frac{3}{8}$ in., and cut it to shape as per sketch B, $1\frac{1}{4}$ ins. along the length of key or rib by $1\frac{1}{2}$ ins. other way; dress it up nice and square on all edges and keep the key a nice $\frac{3}{8}$ in. wide, in fact, a wee shade—Yes! the writer works to "shades" now and then; they're handy sizes—over for future scraping or filing to fine fits. Be sure the bottom of your main block is quite square with sides and doesn't rock any when on surface-plate. Get a pair of vice clamps—two bits of cardboard'll do—put block in vice, base upwards, place the locating piece on it and shift around until back edge of key is $1/16$ th ins. from back edge of block and dead square with it. Scribe deeply the position on base along both edges of locating piece. Put a pop mark on base and ditto on locating piece just to show there's no ill feeling and show us where we are (or were). Remove, and $1/16$ th in. in from each of the lines just scribed mark another one. By these two inside lines you remove the bulk of metal for housing the locating piece, so pop lightly every $\frac{1}{8}$ in. or so, and also scribe a line $\frac{1}{8}$ in. back from the edge of base for depth of slot. Hacksaw down just clear of these lines and either file or chip out. You've got a shaper? You're lucky, chum, use it. Just leave half of the little pops visible. So far so good; now, with a nice new three-square file, undercut the edges to form the dovetail $1/16$ th-in. back, i.e., just underneath the two lines first scribed. File, scrape, or otherwise dress up exactly to lines marked, which gives a width of $1\frac{1}{2}$ ins. at bottom of dovetail, which is same as locating piece, square with key. File away the edges of this now to fit the slot—easier to do than slot to suit dovetail—and for Lord's sake mind which edges you do file. There's some work wasted if you miff the job, and it's so-o easy to let one's mind wander. Keep trying the little plate in the slot see where it's showing bright and ease it until it's a nice hammer fit in either way. The hammer, by the way, should be a "clockie's," and use a little brass drift so's not to spoil the finish of locating piece. At the junction line where the locating piece slides in drill, tap and countersink for a No. 2 B.A. screw; that is, of course, through both, and prevents piece sliding out. If the fitting is good there isn't much need of it.

Now we come to drilling the holding-down hole. Find the centre of the rib or key piece

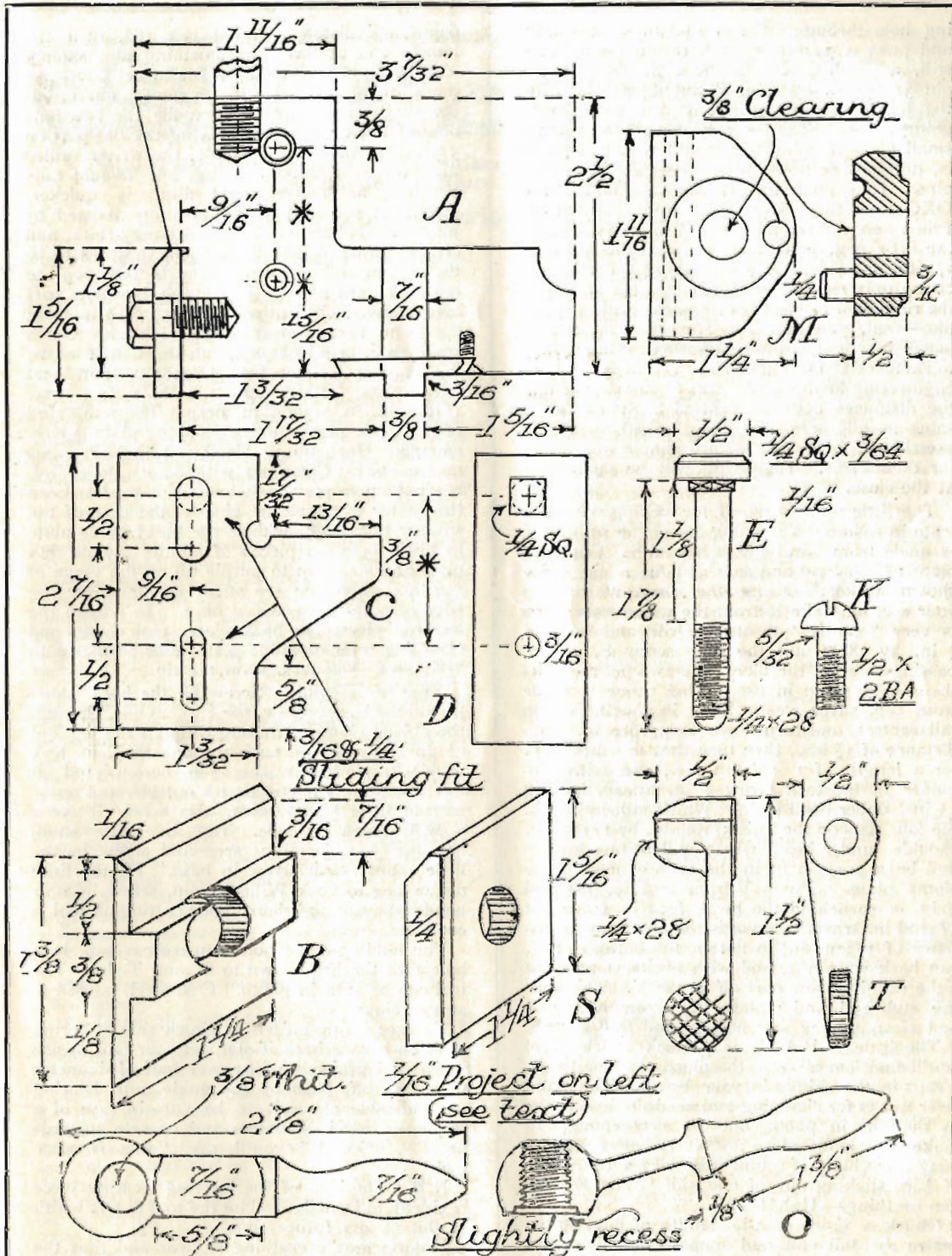
and pop centre and drill, using about $\frac{1}{8}$ -in. or $5/32$ -in. drill, and the method shown in sketch (Fig. 1). Go on through the piece and right through the block as well. Take out the piece, and, in same position on tailstock pad, open out $5/16$ th in. and then $7/16$ th in. Replace locating piece, and, using big hole as guide and going very carefully—though don't get windy or it will happen—drill through the remainder. If you have a big hand vice put a pair of copper jaws in and grip the whole doings in that while the $7/16$ th-in. drill goes through the $\frac{3}{8}$ -in. rib. It's not so bad as it looks on paper, though. The $\frac{3}{8}$ -in. tapping hole at the back is best left until the little square plate is made up, so's you can mark the location of hole in block from that in the plate. All other holes in block may now be drilled from tailstock.

The little square plate is next cut out of $\frac{1}{4}$ -in. M.S. sheet or flat stock filed up, centred and



Machining the Body of the Cutting-off Tool.

drilled $\frac{3}{8}$ -in. clearing. Make it $1\frac{5}{16}$ th ins. square, so as to project on left side of block by $1/16$ th in., and below the base by $3/16$ th in., same as locating key. Now finish filing up the back end of block, where this plate fits, dead square both ways, and place the latter snug up against the top edge of its bed—file a little clearance groove where the top comes—see that it's projecting on the left; it's got to on the bottom, anyway, as it can't go past the ridge filed in the block. Stick a scriber through the hole and mark the location, centre-pop the hole, bolt on to angleplate on saddle as per sketch (Fig. 2), and drill $19/64$ th in. or $5/16$ th in. for $\frac{3}{8}$ -in. tapping. Tap same and fit a stud about 2 ins. long. The little Willis tool clamp M is made next. Cut this from $\frac{1}{2}$ -in. stock, $1\frac{1}{4}$ ins. by $1\frac{11}{16}$ th ins., same overall size as the tool-rest; draw diagonals and centre. Place in four-jaw and locate as mentioned in a previous article. Tail centre, etc., and turn the boss about $\frac{3}{8}$ in. diameter and about $\frac{1}{2}$ in. high; run a $\frac{3}{8}$ -in. clear-



DETAILS OF COMPONENTS OF BACK CUTTING-OFF TOOL FOR LATHE.

ing hole through. Offset in chuck broadways and push a $\frac{3}{16}$ -in. drill through, or, better still, a small D-bit. Turn a little silver-steel pin $\frac{3}{16}$ in. by $\frac{1}{2}$ in. in the shank and leave the head the same height as the tools you're going to use. Rub the rag off the head with a small file. If going to use different tools, that is, different sections, make a set of these little pins. They push in. If you can find a few OXO tins, they do fine for things like these. File a bevel off the underside $\frac{1}{2}$ in. wide opposite the little peg, leave an $\frac{1}{8}$ in., and file a groove $\frac{3}{16}$ in. wide. When gripping the tool, the clamp only rides on a knife edge (see photo), if the ridge just prepared is rounded. And it grips like—well, you know. The two sheet steel plates now engage our attention. Make these to sketches C D of tool steel $\frac{1}{16}$ in. Model engineering firms carry stocks of same. See that the distances between centres of holes is the same in all three cases as marked with * in sketches A C D. These are simple and speak for themselves. Tempering will be dealt with at the close.

The little thumb lever T for locking the guide plate in position is also dug out of the solid, and is made from $\frac{1}{2}$ -in. square bar M.S. Cut off a piece $1\frac{1}{2}$ ins. long and saw and file to the shape shown in sketch or any other shape which suits your eye, but take it from the writer this shape is very "comfy" to use. Drill and tap for $\frac{1}{4}$ in. by 28 to suit the long screw E, which, passing through the block and two plates, locks them solid when in use. This screw is made from $\frac{1}{2}$ -in. silver steel. Place in chuck, run up tail centres, and turn down to $\frac{5}{16}$ in. for a distance of $1\frac{1}{8}$ ins., then turn that down to $\frac{1}{2}$ in. for a length of $1\frac{13}{16}$ ins., and with die-holder in tailstock screw $\frac{1}{2}$ in. by 28, leaving $1\frac{1}{2}$ ins. under head plain. Whilst still in chuck, file four flats on the little $\frac{5}{16}$ -in. by $\frac{1}{16}$ -in. shoulder under head, which will form a square and be a press-in fit in the square hole in the clamp plate. Put a V-front tool in rest and $\frac{3}{8}$ in. or so behind the head, feed in for about $\frac{3}{32}$ in. traverse towards the chuck for a distance of $\frac{1}{32}$ in. to flatten the bottom of V, run back your rest, and with hacksaw and the lathe running slow part off at the V. Take out the stub end and replace the screw head out and clean up the saw marks, and that's done.

The little 2 B.A. K is a stock article, and you'll find 'em all over the place—two or three, p'raps in the chinks in your bench. The hand lever nut O for clamping tool needn't be so fancy as the one in photo, but it's easy enough to make and looks nicer and feels better than a dirty great lump of round stuff with a 3-in. piece of $\frac{1}{2}$ -in. sticking out of one side. You've seen 'em on things—Ugh!!—??

Chuck a $3\frac{1}{2}$ -in. or 4-in. length of $\frac{3}{4}$ -in. M.S., centre the tail end and support on tail centre and turn down to $\frac{7}{16}$ in. for $2\frac{1}{2}$ ins., then by manipulating the slide-rest handles in relation to

depth and distance of cut required, turn the handle end of lever to something like sketch. You may need to file up a bit to get your tool marks to merge nicely into a smooth curve, but the shape is the thing. Next file the two flats one on top and bottom, leaving the flat portion $\frac{5}{32}$ in. thick. Personally, the writer milled his with an endmill in a jig, but 'twould take too long to describe, and filing is quicker. Wangle the ball part by turning, assisted by judicious application of file and emery-cloth, and cut off. File a flat off that side destined to be the bottom at, say, $20-25^\circ$ from its axis, pop the top and centre drill, and, with the flat part against tailstock drill-pad, drill $\frac{19}{64}$ in., and tap $\frac{1}{8}$ in. to suit stud on top of block. Get a spare stud, grip in chuck, run the handle on it, flat outwards, and face off the bottom and remove the metal round the hole for, say, $\frac{1}{16}$ in. by $\frac{1}{32}$ in. deep. The tempering of the guide plate and its clamping plate is easy enough. Heat up to blood red in both cases and quench. Clean up with emery-cloth and, holding on a previously-heated plate, let down the colour to purple or blue in the case of the smaller one, and, holding the lip of guide plate in pliers between pieces of potato, lay on hot plate and let down to purple till on the verge of the lip; when you see straw colour under the edge of potato quench at once. To harden the locating piece, the back plate, tool clamp and clamping lever of guide plate case—harden with "Kasenit"—directions on the tin.

Now to assemble. Screw on the back plate, thread the larger screw, the $\frac{1}{4}$ in.-28 one, through the oblong clamp plate and through the top slot of guide plate, and push through the $\frac{1}{2}$ -in. hole in block, place a washer $\frac{1}{2}$ -in. bore $\frac{1}{32}$ in. thick by $\frac{1}{2}$ in. diameter on the outside, and screw on the little clamp lever, also screw in your 2 B.A. screw at side. Tap in with small hammer your locating piece and screw in the little countersunk screw in base. Fit the little pin or peg to your Willis clamp, screw in your hand lever nut and there! your cutting-off tool is complete.

The holding-down bolt is merely a $\frac{3}{4}$ -in. hex. bolt with the head sawn to fit your T-slot. The tool can be seen in photo. Cast steel, harden to straw colour.

To use: clamp on left or chuck side of boring table on last or back T-slot, set your tool upside down and projecting just over half of diameter to be cut off, push up the guide until bearing on underside of stock to be cut—in case of a screw, on head diameter—and operate towards user. "Gosh!" you'll say, "this is some tool."

N.B.: The idea of the inserted locating piece is chiefly to be able to adapt the tool to any width of slot at any future time.

Hoping that everything is clear and that the Editor and reader are not bored, the writer—er—ceases to write.

PRACTICAL LETTERS

from OUR READERS

Lathes for Universal Fine Work.

DEAR SIR,—I see my friend E. H. writes again on this subject. The price he mentioned in his first letter was what caused me to write you. Surely, it is evident that lathes are dearer to-day, otherwise how could Drummond have put his 4-in. lathe on the market then at £5, whereas to-day it is £9. Their 3½-in. lathe was sold then at £13 10s. and is now £26 10s.

I only mention these two as they must be well known to all of us.

I do not think motor-cars are comparable to lathes. A lathe is a standard article; there is no alteration in design for ever so many years, whereas the car of to-day was not standardised twenty years ago nor was there the demand for it then as to-day.

Whilst one can, as says E. H., buy better cars for less than pre-war prices to-day, he ought not to say that the workmanship is to-day infinitely better. The workmanship on some of the old cars was wonderful, even if perhaps unnecessary. The object of all mass-production is to eliminate cost of workmanship. The workmanship is put into the special machines, jigs and tools at colossal expense, designed to produce the component parts which, assembled at a minimum cost, make the car or any other mass-production article of the present day.

Therefore, the first essential for mass-production is mass demand, continuous and increasing.

The whole problem is rotten at the core. Anyway, there is no mass demand for lathes, nor is there ever likely to be.

So the precision lathe of to-day is identical with that of years ago, but increased in cost by the higher cost of workmanship.

In fact, it is more and more difficult to get skilled labour at any price since this means years of apprenticeship and assiduous hard work, which the present generation will not devote to the object of becoming a skilled workman.

Such skilled workmen as are available are absorbed in the manufacture of the special machines, jigs and tools I have previously referred to.

There is nothing interesting or novel in all this. I take it we knew very well in England years ago all about mass-production methods, but the mass demand was not there, except in isolated cases, such as household utensils, tin kettles, kitchen sinks, and so on.

Most of what E. H. says is true enough, except that the good design has always been there, the same for years and years.

Our Editor might bear that out, viz., the standard precision lathe with draw-spindle, glass-hard cones and bearings, but readers will not get it for the £13 (or was it £15?) E. H. imagined it possible.—Yours faithfully,

GEORGE ADAMS.

What Model-Makers Are Asking For.

DEAR SIR,—I have read with interest your article on "What Model-Makers Are Asking For," and, in answer to Mr. H. Price, I supply complete sets of

parts machined to construct any gauge loco; all my locos are built so that same can be taken to pieces with a screwdriver. Samples will be on my stand at the Hounslow Model Railway Club Exhibition, March 16. Further, in answer to Mr. H. W. Openshaw *re* complete and separate working drawings, my draughtsman will get out any of these on receipt of particulars at a small charge (black and white ink drawings).—Yours faithfully,

THE MODEL RAILWAY CLEARING HOUSE,
C. THOMAS.

The Model-Maker's Maze.

DEAR SIR,—It is from mixed (not muddled) motives that I venture into the present erratic discussion, which commenced with the difficulties of Mr. Dillon and has to date involved the Boy Scouts, H. G. Wells and Mr. Pelman. Evidently there must be some connection between this apparently disunited trio, otherwise—why "these presents"? (Readers will observe as I progress how closely I intend to stick to the point at issue.)

As Mr. Dillon appears to be the prime agitator, let us first deal with *him*. Can he use a file? or did his first and only attempt result in a curiously lop-sided production reminiscent of the gadgets on Wells' "time machine"—of whom and which more anon. Has he never by some strange chance heard of hacksaws, hammers, punches, chisels, vices, emery-cloth, breast-drills, etc., etc. "Want of cash" is surely no excuse to a literary chap like Mr. Dillon. My first outfit cost from three to seven bob, but previously to that I boasted a steam turbine that *worked*, whose genesis was a vamped Brasso tin, a bit of a currant bush, and various other odds and ends. The whole issue chug-chugged round with a pleasant puffing noise. And my model glider? Henry Tate if you like, plus a yard and a half of brown paper secured to the framework by the juice of the common snail. The fuselage nose was loaded with a clothes-peg. *And it glided well.*

The model aeroplane which naturally followed, well, as far as I remember the motive power was a yard of garter elastic. As for the fountain which washed the whitewash off the ceiling? Perhaps it should not be mentioned, except to say that the cycle-valve was made airtight with *soap*.

I could ramble on thus for hours, but the upshot of it all is *this*: Mr. Dillon as a model engineer is hopeless without the desire and the *will* to achieve. His case, I am afraid, is not a model engineering problem, but a problem in psychology. When I made the monstrosities mentioned above I had no MODEL ENGINEER or Junior Mechanics at my elbow, only a few well-worn B.O.P.'s and a couple of like-minded pals. But now I realise my assets to have been: profound fascination by mechanical things, bags of patience, and a desire to pry into the unknown. And because of these things I realise my shortcomings. No, Mr. Dillon, I do not lack tools, if you carted all my possessions away to-morrow I would soon repair the loss one way or t'other

Wherever there was a scrap-heap to be raided or junk to be "scrounged," you would find me there, if my pocket was empty, and the desire to *construct* still hot upon me. No, what I lack are these intangible things: orderliness, precision and efficiency, and I have a shrewd idea there are many of us in the same boat, and by the same token Mr. Dillon suffers from a somewhat similar mental vacuity. It is no shame to him, but he should seek to fill the void as I am doing, and when he has attained a modicum of success, I prophesy we shall hear more of Brother Dillon, and likewise, when I do, ditto me.

Now for Brother Holloway—a friendly dig. Why on earth he wishes to compare Brother Dillon with Wells I'm darned if I know; likewise, why he slings mud at Wells I'm blown to understand. And what in the dickens is the *bona-fide* model engineer but an out-and-out dreamer in 90 per cent. of cases? And what were Watt, Stephenson, Trevethick, Langley, Maxim, Maxwell, and a host or others but dreamers, all dreamers. *But they believed that their dreams were destined for the light of day, and rested not till they had achieved a measure of success.* I don't believe Mr. Holloway has ever read Wells understandingly, or has read his early history, or he would appreciate the singular talent and energy of the man. Wells' books, to my mind, are models of lucidity, and in that remarkable story, "The Time Machine," he should have earned the appreciation of every model engineer, for does he not open it with a discourse and a strange affair concerning a model of a machine which, when the remote investigations of Einstein and the other chappies into the realm of the elusive fourth dimension are brought to an approximate conclusion, may do in the days of our children what the flying machine did in our parent's youth, nay, far more, for if and when that possibility arises, bang goes all our preconceived notions of the *limitations of space and the destructibility of form.* Yes, if Mr. Holloway can go one better than Wells, good egg to him, but he would find it difficult, and what

price—in conclusion—the Martian machines in "The War of the Worlds." And, just to stir up a little more mud, who's going to be the first to devise a machine to fly in a vacuum. Come on, you model engineers. This way, Mr. Holloway.—Yours truly,
W. DYER.

Old Sodbury, Glos.

His First Model: the Truth of the Matter.

DEAR SIR,—There is a point in Mr. Dillon's article which his critics appear to have missed, and that is that he has had the enjoyment of reading 1,500 copies of THE MODEL ENGINEER, so that, although he may never have handled a tool, he is nevertheless an enthusiast.

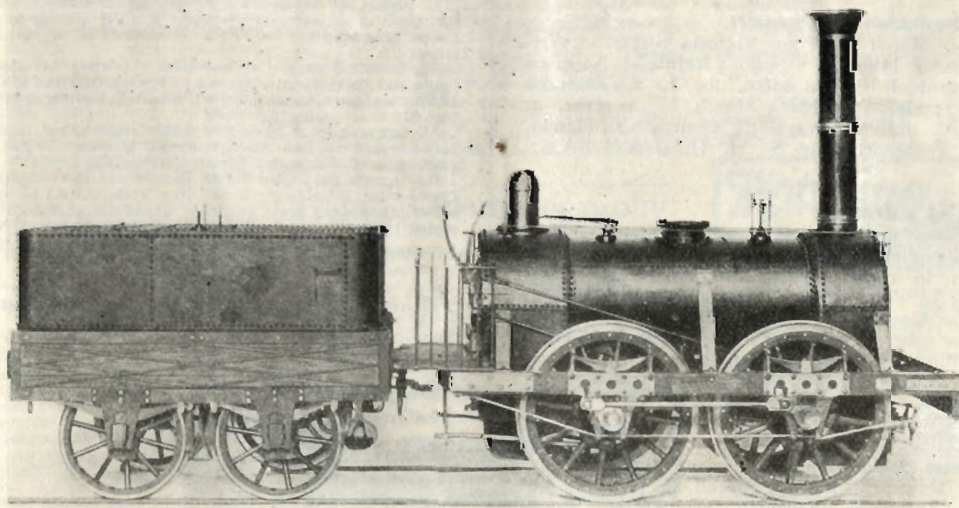
His case is more understandable than that of the craftsman who only buys THE MODEL ENGINEER *now and again.* A man who does not see the paper every week is lukewarm only.

The completion of Mr. Dillon's first working model (he *can't* hold out much longer) will fan the flame to such an extent that we may expect one day to see him walking out of the Horticultural Hall with a medal and a broad grin.—Yours truly,

R. BAMFORD.

Simple Model-Making Tools: The Small Lathe.

SIR,—I have read Mr. Dillon's letter on the subject of simple model-making tools and also the replies which seem very much to the point. Granted that it is difficult, I do not say impossible, to do much mechanical model work without a lathe, and also that a big sum of money is outside the average man's means to be spent on a *hobby*, it remains to be asked what is wrong with the *small* lathe of 2-in. centres or thereabouts? A vast percentage of the turnery on a model of any kind can be done on this size of lathe—the chief exceptions being flywheels. I designed a 30 c.c. petrol engine which could be entirely machined (as far as turned parts go) on a 2-in. lathe.



Model of a "Samson" Class Locomotive, approximately 2 ins = 1 ft., in the Arts and Metiers Museum, Paris.

(This Model was referred to by Mr. A. M. H. Solomon in these columns last week.)

There are several of these small tools on the market—the Wade, Portass and Exlet seem to be the best known and are no doubt all excellent. As regards the latter, I can truly say it is all that the makers claim. It will bore and turn to a "thou." The headstock mandrel bearing, owing to the peculiar design, is of great length, and very little trouble was experienced with chattering. I turned a 4-in. diameter casting in it with only ordinary care. The price is £2 17s. 6d., and although I have bought a 4-in. lathe with attachments recently at about £30, it is not half so accurate as the "little chap" was.

The other small lathes are quite possibly as good but I have never tried them. I need not say I have nothing to do with the Exe Engineering Co., Exeter, the makers, but I feel that all the talk about not being able to turn a job under £15 or so is rather unnecessary.—Yours faithfully,

C. S. COWPER-ESSEX.

INSTITUTIONS AND SOCIETIES.

The Society of Model and Experimental Engineers.

MEETINGS.—At Caxton Hall, Westminster, at 7 p.m. Wednesday, March 6, Competition, Track and Model Night. Special competitions: a guinea for the best-ground set of six lathe cutting tools, and a guinea for the most interesting self-contained power unit. Tuesday, March 26, Ladies' Night. A popular lecture by Mr. J. H. A. Whitehouse, of the B.B.C.

WORKSHOP.—Further demonstrations shortly.

VISITS.—Mid-week visit to the headquarters of the B.B.C. Saturday afternoon visit to Mr. S. W. Simpson, at Brentwood.

Any reader of THE MODEL ENGINEER who is not already a member of this or a kindred society, is cordially invited to write to the Secretary for a card of invitation to one of the meetings and/or an invitation card to inspect the workshop.

Secretary, R. W. WRIGHT, 202, Lavender Hill, Enfield, Middlesex.

Junior Institution of Engineers.

Friday, March 1, at 39, Victoria Street, S.W.1, at 7.30 p.m., informal meeting; lecture, "Notes on the Control of Electric Lifts," by L. S. Atkinson (member); slides. Friday, March 8, at same, at 7.30 p.m., ordinary meeting; chairman's address, "Road Transport," by S. H. Hole, A.M.I.A.E.; slides.

Institute of Patentees.

The following inventions have been received during the week ending February 16: Improvements in I.C. engines; in racing tracks for dogs and other animals; in receptacles for containing condiments; in silos or bins for the storage of grain or the like; in bins or other receptacles for storing washed grain; in switching apparatus for signalling; improvements in and relating to pit and the like props and supports.

Secretary, G. DRURY COLEMAN, 39, Victoria Street, S.W.1.

Manchester S.M. and E.E.

NEXT MEETING.—Friday, March 1, at the Manchester Technical Schools, Whitworth Street, Manchester, at 8 o'clock. This will be a general model night. Members are asked to bring work to this meeting.

Hon. Secretary and Treasurer, W. E. WOOD, 20, Albert Place, Longsight, Manchester.

Glasgow Society of Model Engineers.

NEXT MEETING.—March 6, at 7.30 p.m., in the Royal Technical College, George Street. The speaker will be Mr. Norman Young; subject, "Telegraph Pictures," illustrated by lantern views. Mr. Young will be well remembered for his very interesting address on oil engines last year. Please note that any interested MODEL ENGINEER reader is very welcome at our meetings.

WORKSHOP.—March 20, demonstration by Mr. J. W. Smith on gramophone sound boxes, their construction, and how to set them for best results.

Volunteers are wanted to make the workshop more compact and get all the various tools, etc., in perfect order. The making of tool lockers for members' private use, etc. A small prize will be offered for the best suggestion regarding the proposed new lay out to make full use of the recent small extensions. Mr. Newlands is now in charge of the reference library and hopes to have it in going order shortly.

Note: Members are requested to put back copies of THE MODEL ENGINEER in their proper place after using them.

Hon. Secretary, J. LINDSAY, 105, Calder Street, Glasgow.

Edinburgh Society of Model Engineers.

The next meeting will be held at 1, India Buildings, George IV Bridge, on Tuesday, March 5, at 8 p.m. Members are requested to bring work or models in course of construction and so make the meeting interesting.

For particulars of the Society write the Hon. Secretary, A. GRIEVE, 70, Raeburn Place.

Notices.

The Editor invites correspondence and original contributions on all small power engineering, motor and electrical subjects. Matter intended for publication should be clearly written on one side of the paper only, and should invariably bear the sender's name and address. It should be distinctly stated, when sending contributions, whether remuneration is expected, or not, and all MSS. should be accompanied by a stamped envelope addressed for return in the event of rejection. Readers desiring to see the Editor personally can only do so by making an appointment in advance.

All subscriptions and correspondence relating to sales of the paper and books to be addressed to Percival Marshall & Co., 66, Farringdon Street, London, E.C.4. Annual Subscription, £1 1s. 8d., post free to all parts of the world.

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"SALES AND WANTS."

(Continued from page iv.)

"Stocktaking." Great Stocktaking Sale.—The following sensational bargains are absolutely genuine. Many of the goods are practically as new, but must be cleared regardless of cost. If any of these goods interest you, don't miss them. Order at once, as there will be a rush on same. Remember, the goods are right. The Old Firm, UNIVERSAL MOTOR COMPANY, Below.

Brand New Latest-type 1½-2 h.p. Universal Two-stroke Vertical Petrol Motor, water cooled, dynamo type, with magneto, carburettor, starting handle, fuel tank, silencer, and pulley, driving 12-20 volt 10-amp. totally-enclosed modern ball-bearing type shunt-wound charging and lighting dynamo, exceptionally robust, and generating instantly; both the engine and dynamo are affixed to one cast-iron bedplate, and switch-board, fitted with main switch, fuse-box, amp. meter, and automatic charging cut-out are included; £11 17s. 6d.; a very nice installation indeed.—Below.

Another very Neat Little Charging Plant, comprising genuine Precision Engine, 2 h.p., with magneto and carburettor—(Yes, a Two-stroke also)—special fan cooling, and including 15-20-volt 10-amp. Enclosed Ball-bearing type Lighting and Charging Dynamo, by the Western Dynamo Company; you can light your villa, you can charge your car batteries, your wireless accumulators; the engine is as new, only been run for demonstration, and both the engine and the dynamo are fully guaranteed by us; £7 15s.; a positive gift.—Below.

And What About Lathes? Here! Splendid little James Archdale 6" Centre 5-ft. Gap-bed Back-geared Screw-cutting Lathe, with automatic sliding and surfacing, 16 slotted saddle, quick-grip tool-post, compound swivelling slide-rest, together with countershaft, faceplate, centres, carrier plate and various spanners; going, going, £12 15s.; an ideal garage tool; turns as solid as a rock.—Below.

Another Very Substantial little 6" Centre 5-ft. Gap-bed Tool-room Lathe, self-acting, sliding, and surfacing, by Manchester Engineering Co., not a tooth off anywhere, tee-slotted saddle, compound swivelling slide-rest, guards to back-gear, reverse motion fitted to traverse, and including countershaft, faceplate, carrier-plate, centres and various spanners: spot cash £8 17s. 6d.; a very neat compact lathe; wire secures.—Below.

Lathes! Lathes! Still Another.—5" Centre 5-ft. Bed, by F. R. Reed. Good lathes these Reed's. Sliding and screw-cutting, hollow mandrel, back-geared (self-locking), tumbler gears for right and left threads, quick return to saddle by rack and pinion, and all operations performed on apron in front of saddle, countershaft, centres, faceplate, carrier-plate, various change wheels; £9 15s. These excellent tools only want seeing to command immediate sale. A modern lathe for £9 15s., and very accurate.—Below.

6 to 8 h.p. Stationary-type Engine, fitted with trigger high-tension magneto, and Zenith carburettor, flywheel, pulley, water tank, silencer, fuel tank; the engine is governed, and exceptionally steady running; magnificent dynamo engine, or workshop use; £11 10s.; 12 months' guarantee.—Below.

Dynamos! Dynamos! Brand new genuine Mira Dynamo, 12 to 20 volts, magnificent machine, cost well over £8, with automatic charging cut-out, driving pulley, and slide rails, £2 10s. What a wicked price to be sure! It's got to go, and £2 10s. gets it.—Below.

Several Four-cylinder Magnetos, good sparkers, 10s. 6d. each. Contact-breakers alone worth more money. Single-cylinder, 9s. 6d. each.—The Old Firm: THE UNIVERSAL MOTOR COMPANY, St. James' Road, Derby.

"Let Me Explain," by Archibald Williams. Most of us do not know how to explain! Try to "explain" a motor bicycle, or just your own ordinary electric light. The author has the gift of explanation, and deals with Aeroplanes, Big Guns, Cold Storage, Dredgers, Electric Motors, Escalators, Flour Mills, the Kinematograph, Mechanical Typesetting, Motor Cars, Paper-making, Snow Ploughs, Steam Engines, Steel Manufacture, Wireless Telegraphy, Wireless Telephony, Water Supply, and Wood-cutting Machinery. Just the book for the fireside! Price 3s. 3d. post free from PERCIVAL MARSHALL & Co., 66, Farringdon Street, London, E.C.4.

1" Scale Loco Chassis, requiring repairs, odd fittings, 37s. 6d.; Volumes "Modern Motor Car," cost £3 3s., unsold, 35s.; A.P.M. Camera, 4s. 6d.; 200 odd numbers MODEL ENGINEER, 5s.; offers.—TUNLEY, Huddersfield, Gloucester.

Small Wood Screws, turned, perfect finish, from 3/32" x 4 upwards.—MULLER & Co. (England), Ltd., 6, Southampton Buildings, Holborn, London, W.C.2.

New Cycle Accessories at Clearance Prices. Send your requirements. 4½" nearly new Odell Lathe, £12; High-speed Stationary Petrol-Paraffin Engine, £4 10s.; smaller Set, with Dynamo; 3½ h.p. Humber Motor Cycle Spares; Deemster Car Spares.—MATT. PRICE, Melyn, Neath.

Light Treadle Lathe, 2½" centre, fully compound swivelling slide-rest, various chucks, £2; Gramophone Motor, double spring, cast frame, £1 (cost £3); exchanges entertained.—WILLIAMS, 24, Nealden Street, Stockwell, S.W.9.

10-volt 5-amp. Dynamo, 15s.; or exchange Bench Drill.—"Vaughans Arms," Trehafod, S. Wales.

"Iron-Steel-Cement," repairs wrought or cast. Tins 1s. 3d., 2s. 6d., 4s. 6d., 7s. 6d. posted.—ALBERT FEATHER, White Abbey Road, Bradford, Yorkshire.

200 "Model Engineer," 10s.; 24 Parts "Wireless Encyclopedia" 10s.—41, Wendover Street, High Wycombe.

"The Steel Highway," by Cecil J. Allen. This book is divided into two sections: (a) the first part dealing with the planning and location of railways, their notable engineering features, and the laying and maintenance of track; (b) the second part is concentrated on railway working, from the designing and construction of locomotives and rolling stock to the working and control of the trains. All written in an interesting and alluring style. Price 6s. 6d., post free by return post, from PERCIVAL MARSHALL & Co., 66, Farringdon Street, London, E.C.4.

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"The 'King' of Railway Locomotives," the book of Britain's Mightiest Passenger Locomotive, for boys of all ages. 140 pages, fully illustrated. Price 1s. 2d., post free.—PERCIVAL MARSHALL & Co., 66, Farringdon Street, London, E.C.4.

Splendid Coloured Plates of Locomotives are now ready: "King George V," price 1s. 2d., post free; "Royal Scot," 1s. 2d., post free; "King Arthur," 1s., post free. Sent by return post.—PERCIVAL MARSHALL & Co., 66, Farringdon Street, London, E.C.4.

Home Cinematography.

Cinematograph Films and cheap British-made Machines, Accessories; list free.—"FILMERIES," 57, Lancaster Road, Leytonstone, London.

"Working Your Home Cinema." Valuable information. Also bargain lists Standard Films Postage 2d.—"WAYLAND," 109, Kenlor, Tooting, London.



Boilers in Steel or Copper, all types and sizes; Locomotive Boilers from 4" scale made to fit your frames, flanged plates; supplied copper or steel.—GOODFRAND, Marlborough Road, Gillingham, Kent.

Model Yachts. Build your own. Complete Set of Parts, 5s. Send 3d. stamps for plan and full instructions.—CAPRI MODEL YACHT WORKS, Church Walks, Llandudno.

Model Yacht, 5 ft., mahogany planked, worth £5; exchange for Lathe or anything in model line; also Auto Knitting Machine for sale, cheap.—CATERICK, 1, Ardville Road, Norris Green, Liverpool.

Loco, engineer built, 1½" gauge, wants slight finishing, £10 or near offer; cheap.—FROST, 65, Lloyd Street, Stockport.

Exchange ½ lb. Silver Solder for small Bench Drill, 2½" chuck, or anything useful, or sell best offer.—PARTRIDGE, 105, Regent Avenue, Harrogate.

"00" Gauge Signals, 2½" high, 1s. each, postage 2d.—WILFRID BOOTH, 43, Cope Street, Hyslop Green, Nottingham.

Horizontal Reversing Engine, 2½" x 1½", high speed, engineer made, perfect, with Goodhand Boiler, 30 x 12; best cash offer accepted.—8, Lawrence Street, Sandiway, Notts.

5-ft. 8" Scale Model B. Class Torpedo Boat Destroyer, perfect. What offers.—58, Addison Road, Hove, Sussex.

Gauge 0 Electric Railway, bargain 75s.; or exchange small Lathe.—H. JAMES, 37, Woodfield Crescent, Kidderminster.



Wet H.T. Batteries, easy to build, long life, constant output, self-charging. Parts per dozen: Jars, 24 x 14 square, 1s. 3d.; Zincs, 11d.; Sacs, 1s. 2d. doz.; dozen Cells (16 volts), complete with bands and electrolyte, 4s. 2d., post 9d.; Sample Unit, 6d. Illustrated booklet free. Wireless list free. Amplifiers, 19s.; Two-valve Sets, £4.—L. TAYLOR, 57, Studley Road, Stockwell, London.

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Highly Sensitive Microphones for radio amplifiers, etc. See Electrical Column.—FREDK. ADOLPH.

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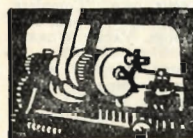
Hudliss Special Three-wheel Two-seater; illustrated in "Light Car," March 20, 1928; cost £200; speed over 50; £20.—31, Park Drive, East Sheen, S.W.

Light Car Builders.—Parts supplied as used by Hudliss Special, illustrated "Light Car," March 20, 1928. Steering Heads, complete Power and Transmission Units, ready to fix in car.—Address: HENGLASS, 31, Park Drive, East Sheen, S.W.

Magnetos Re-wound, Overhauled and Re-magnetised from 10s.; satisfaction guaranteed.—J. TROSCOR, Bold Bridge, near Widnes, Lancs.

Exchange for Printers' Type or Material, 1922 Cornsight, 2-stroke, 3 speeds, clutch, kick-start, chain-cum-belt, fully equipped; also Tan-Sol and Speedometer, or sell £10.—BAYES, Lindford, Stamford-le-Hope, Essex.

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LIGHT MACHINERY

Sales and Wants



Lathes.—Britannia, C.A.V., Drummond, Edgar, Eta, Exe, Milnes, Patrick, Wade, and all leading makes in stock.—BUCK & RYAN, 310-312, Euston Road, London.

Lathes, standard makes, easy terms; lists free.—Machinery Dept., J. G. GRAVES, LTD., Sheffield.

Milling Attachments for Lathes, Dividing Mechanisms, Combination Woodworkers. Experimental work and models to order.—WHEELER CO., LTD., Trench, Wellington, Shropshire.

4" Drummond Screw-cutting Lathe, complete with treadle and power drive, as new; will exchange for good Plain Lathe of larger centre and length of bed.—MACK, Madoc Street, Llandudno.

Bar Bed Precision Lathe, by Telegraph Construction and Maintenance Co., 1½"×10" bed, takes over 5" between centres, divided head, 4 rows, tailstock (2 runners), hand-rest, slide-rest, filing roller rest, 2½" 3-jaw reversible S.C. chuck, 12 collets, dead centre attachment with spare centres, ejector and ferrules, 5-step chucks, driver-plate chuck, draw spindle, bell chuck, boring and turning tools, 3 carriers, bronze driving wheel on arm with vice for hand drive; in oak case (which wants repair). £8.—GENTRY, 66, Farringdon Street, E.C.4.

You Needn't Take Risks! In 1907 we started making Chucks for M.E. readers, and, having stood the test of time, we're still going strong. We supply most leading lathe makers. Chucks sent on approval against cash.—Below.

Independent Chucks! Light model, having four reversible hardened steel jaws, square thread screws. Specially designed to screw direct on to Drummond, Britannia and other light lathes, saving overhang, and weight and expense of backplates. Price: 3½" Chucks, 29s. 6d.; 4½", 35s.; 6", 39s.; 7½", 48s. 6d. Carriage paid. If screwed to fit lathe, 8s. 6d. extra. Larger sizes same style up to 18".—Below.

Chucks! Chucks! Self-centring Chucks, Drill Chucks, Independent Chucks. All sizes up to 30" diam. 5,000 in stock! Write us before buying elsewhere.—Below.

Three-speed Treadle Motors for driving any make of lathe. Ball-bearing Flywheels, 55s.; Plain Bearings, 45s.—STERLING CHUCK CO., Cobden Street, Bradford.

Lathe Tool Bargains!—200 Sets, highest grade, cheap. List, application.—GREENWOOD, Arnside Road, Southport.

90 Wonderful Self-blowing Gas Blowpipes, maker's price 5s., clearance 2s. 6d.—GREENWOOD, Arnside Road, Southport.

Brownie 3½" Bench Lathes, 25s.; Foot Treadles, 35s.; Compound Rests, 15s.; stamp, particulars.—Brown, Pleck, Accrington.

Swiss Files at Bargain Prices. We will send carriage paid 3 dozen genuine Swiss Files, assorted up to 6" of various shapes and cuts. Every variety of file included in parcels. Send 10s. to THE HENRY FILE COMPANY, 52, Norfolk Avenue, N.15. (Goods despatched same day.)

"Record" Bottle Jack, 2-ton, 12s. 6d.; 15-ton Traversing Bottle Jack, minimum 2 ft., 35s.; 6½" Bench Vice, with swivel base, 35s.; Wall or Bench Drilling Machine, slightly soiled only, as sold at 60s., accept 35s.; 3½" Bench Vice, with swivel base and spare jaws for gripping pipes, 6s. 6d.; Brazing Lamp, genuine Barthel, with pressure gauge, 55s.; Table or Bench Vice, 3½" jaws, 4s. 6d.; Joiner's Cramp, 4 ft., accept 6s.; 36" Stillson Pattern Wrench, drop forged, 12s. 6d.; 18" ditto, 2s.; cash with order; all above new and perfect; cash returned if unsatisfactory.—S. HIBBERD, 17, Ash Street, Sheffield.

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Shaping Machine (Norvic), automatic feed, swivelling machine vice, new condition, cost £22, price £12.—31, Park Drive, East Sheen, S.W.

3½" Screw-cutting Lathe, back-gear, hollow mandrel, gap bed, 3-speed treadle, self-centring and other chucks, gears, tools, as new, £6; a good tool.—LIDGE, Lewisham Road, Dover.

Super-Rim Back-gear S.C. Gap-bed Lathe and Treadle, all accessories, £25 or offer.—R. P., 110a, Hindes Road, Harrow, Middlesex.

Model Engineers, also **Woodworking Tools**, suit beginner, lot £2; Circular Saw Bench, brand new, £2; particulars, stamp.—SWALE, 41, William Cook Road, Ward End, Birmingham.

3" to 4½" Accurate Back-gear Screw-cutting Bench Lathes, gap beds, from £7.—SAUNDERS, 4, Anerley Station Road, S.E.

Contents of Workshop.—3½" Drummond Lathe, complete with milling and gear-cutting attachments, chucks, surface-plate, micrometers, scribing blocks, dies, taps, drills, milling cutters, and numerous other tools; can be seen any afternoon or evening.—JACKMAN, 37, Albert Road, Penge, S.E.20.

"Engineering Educator," 30s.; "Electrical Educator," 30s.; exchange for Lathe.—JOHNSON, 203, Poverest Road, St. Mary Cray, Kent.

Compound Slide-rests, swivelling, best quality, every size; lists, stamp.—Geo. GOODMAN & Co., Engineers, St. James', Bristol.

4" Precision Tool-room Lathe, with counter-shaft; 5" Back-gear Screw-cutting Lathe, with countershaft, change wheels, etc.—Below.

Brand New Lathe Chucks, 3 jaws, geared scroll and 4-jaw independent type; if desired, take small machines in exchange.—Below.

For All Kinds of Light Machinery, Flywheels, Pulleys, Plummer Blocks, Bearings, etc., write us, stating your wants.—KNAPTON'S MACHINERY MART, Wade Lane, Leeds.

Middleton.—Horizontal Milling Machine (Archdale), 22×8½" table, back-gear, automatic feed, a beautiful machine, £14 10s.

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Middleton.—Slotting Machine, 1" stroke, automatic revolving table, practically unused, £9 10s.

Middleton.—Small Power Planing Machine (Munro), in beautiful condition, 26"×10", slotted table, £7 15s.

Middleton.—Screw-cutting Lathe (Lupton), 6½" centre, 6-ft. bed, back-gear headstock, compound slide-rest, slotted saddle, in beautiful condition, complete with change wheels and countershaft, £9 15s.

Middleton.—Fortuna Power Hacksaw, 12" blade, 48s.; Fly Presses, No. 2, complete fly, 19s. each; 16 ft. practically new 3" Leather Belting, 17s. 6d.; Crocodile Shears, 6" and 8" blades, 7s. 6d. and 9s. 6d. each; 12" 4-jaw Independent Chuck, 25s.; Compound Swivelling and Graduated Slide-rests, suitable 6½" and 7" centres, indistinguishable from new, 22s. each; best quality Turning Tools, 7½d. lb., 3-lb. lots; Oil Stones, best quality, 2s. each.

Middleton.—Best English Cast Steel Files and Rasps, 6"—10", 4s. 8d. doz.; 10"—16", 6s. 6d. doz.—MIDDLETON & Co., Hazelwell Street, Stirling, Birmingham.

Drummond 3½" Treadle Lathe, with accessories, £12; Hand Shaper and Machine Vice, £4 15s.; Vertical Slide, 27s. 6d.; Drilling Spindle, 15s. Evenings.—89, Marlborough Road, Bowes Park, N.22.

3" Turret Lathe, first-class little tool, could easily be adapted for plain turning, well worth 32s. 6d.; Drop Forgings for chuck jaws, would be very handy, fitted to faceplate, with 1" slots, per set of 4, 3s.—GENERAL SUPPLIES CO., Hightown Heights, Liversedge.

Electric Grinders, surplus stock (Watts Electric Co.), very useful in lathe, milling machine for grinding pins, cylinders, shafts, cutters, drills, with emery wheel, perfect order, tested, D.C. 200 to 250 volts, 25s., complete with swivelling tool-post shank.—"Lido," Ridgeview Road, N.20.

Treadle Lathe, 2½" centre, 20" bed, slide and hand-rests, chuck, carrier, really good make and condition, £3 10s.—PHARE, Chelston, Torquay.

6" B.G. Treadle Lathe, compound slide-rest; exchange for 1½ h.p. 4-stroke Petrol Engine, governed.—41, Wendover Street, High Wycombe.

Screw-cutting Lathe, 6" centre, 5-ft. bed, change wheels, chuck, faceplates, countershaft, new condition, £15.—MUDDIMAN, 10, Towcester Road, Northampton.



"Lion" Oil and Petrol Engines, complete outfits, from £12; British made; deferred terms.—LION ENGINE CO., 160a, Pentonville Road, N.1.

Guaranteed Gas, Oil and Petrol Engines, cheap; stamp, reply.—BROWN, Trafford Grove, Stretford, Manchester.

Stewart 1½ h.p. Air-cooled Cycle Engine, only used few experiments, new condition.—31, Park Drive, East Sheen, S.W.

Senior Petrol Engine, ½ h.p., Lucas magneto, carburettor, governors, etc., new, cost £17, accept £10; Gardner Gas Engine, 1½ h.p., £7; Hooker and Harris Petrol Engine, 1 h.p., magneto and carburettor, £4 15s.—AUSTIN, Churchside, Hasland, Chesterfield.

Engine (steam), 3" cylinder, 6" stroke, locomotive type boiler, complete, for sale £12 10s., or exchange for Lightweight Motor Cycle.—YARE, 120, Regent Street, High Shields.

Gas Engine, 2½" bore, 2½" stroke, magneto, running order, but requires overhauling, £3 10s. or offer.—93, Harwood Road, Fulham, S.W.6.

Horizontal Petrol-Paraffin Engine, water cooled, with tanks, magneto and carburettor, 2½" bore, 6" stroke, needs slight overhaul, first cash! £50s.—J. RICHARDS, Halvington, St. Austell.

3½ h.p. Motor Cycle Engine, Bosch, B.B., perfect, complete, 30s. Wanted, small Lathe.—BROWN, 196, Lewisham Road, Lewisham.

10 Brand New Galloway Portable Steam Plants, oil fired, comprising high-pressure multitubular boiler, vertical copper tubes, complete fittings and mountings, and donkey pump, W.P. up to 150 lb., height 24"×15" diam., complete tank unit, with water pump, fuel pump, pressure chambers, etc., suitable for driving small steam engine, pumps, etc.; price £9 10s., delivered U.K.—C. DUNLOP AND CO., Bassin Loubet, Boulogne-sur-Mer, France.

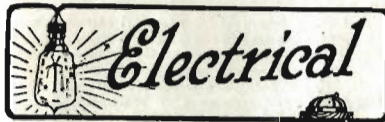
10 Wilton Pumping Sets, comprising 2 to 3 h.p. vertical Wilton oil engine, driving centrifugal pump, capacity 2,400 g.p.h., 60-ft. head, complete high-tension magneto, mounted on C.I. bed, price £20 each, delivered nearest railway station.—C. DUNLOP & Co., Bassin Loubet, Boulogne-sur-Mer, France.

Three 2 b.h.p. Horizontal Hopper-cooled Fairbanks' type Oil Engines, 2 flywheels, 15"×2" face, 350/450 revs., H.T. magneto, mounted on C.I. base, complete fuel tanks, etc., condition as new, price £9 each, delivered nearest railway station.—C. DUNLOP & Co., Bassin Loubet, Boulogne-sur-Mer, France.

3 h.p. Vertical Petrol-Paraffin W.C. Engine, complete; also 20-volt 12-amp. Dynamo; or sell separate; £6 or near offer; good condition.—"Merivale," East End Road, Finchley, N.2 (Phone: Finchley 0317.)

"Engines"—(Contd.)

Ball-bearing Steam Car Engines, fully guaranteed, 70s. each; 1921 4 h.-p. Douglas Motor Cycle, 80s.; 6½" Centre Back-geared Headstock, 15s.; "Metzler" Piano-Player, with 80 rolls, 50s.—22, Caddington Road, Cricklewood, N.W.2



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65 h.p., 440v. D.C., 90s.; Lundell 25 h.p.,
220v. D.C., 70s.; Bergman 5 h.p., 220v. D.C.,
90s.; Gr. L. 1 h.p., 200v. D.C., 70s.; Adnil
1 h.p., 200v. D.C., 70s.; Verity 1 h.p., 220v.
D.C., 70s.; Verity's 1 h.p., 250v. D.C., 70s.;
1 h.p., 200-250v. D.C., 60s. each; 1 h.p., 220-
250v. D.C., 50s. each; 1 h.p., 460v. D.C., 52s. 6d.
1 h.p., 220v. D.C., 30s. each; 1 h.p., 250v. D.C.,
12s. 6d.; 1 h.p., 200v. D.C., new, 37s. 6d.; 1 h.p.,
220v. 50 periods 40s.; 1 h.p., 440v. 50 periods
3 phase, 50s.; Waring M.C. Motor, 4 h.p. Uni-
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double-end shaft, 1 h.p., 200v., 3,000 r.p.m.,
with starter, as new, 70s. 5 Jewellers' Sensitive
Drilling Machines, with chucks, rise and fall table
and detachable pistol grip fitting, 110/220v., new,
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output, with double automatic starter and field
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ditto, £7 15s. each; Dynamo 25/37v. 10a., by
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Brass Finishers' Lathes, with chucks and wheels
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and grinder spindle, 30s.; A.C. to D.C. Motor
Generator, 110/220v. 50 periods 1 phase, output
25/37v. 5a., with starter, £6 10s. Numerous
Magneto and Car Dynamos for sale.—MAGSTAR-
LITE, LTD., 325-325a, King Street, Hammersmith
London, W.6. (Tel.: Riverside 0938.)

Brand New $\frac{1}{2}$ h.-p. 200- or 230-volt Single-phase Motors, with start and running switch, £4 5s. 1 h.-p 400/440 volts 3 phase, £4 5s.; all 7 years guarantee; carriage paid.—Knapton's Machinery Mart, Wade Lane, Leeds.

(Continued on next page.)

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Highly Sensitive Microphones, watch shape, will pick up whispered words, faint sounds, quiet conversation from considerable distance, strongly amplify and transmit speech, music, piano, gramophone, orchestra, clock chimes through loud-speaker; best microphone known for making detectaphone, deaf aid, loud-speaking telephone, public address speaker, radio amplifier for crystal or valve, electric sound detector, experiments; each guaranteed efficient; 5s. 6d.; long connecting cord attached.—Below.

A Whisper Amplified to a Roar from your loud-speaker, watch ticking amplified to the noise of hammer blows, by connecting above sensitive Microphone to any valve set, through microphone transformer or through gramophone pick-up.—Below.

Microphone Transformers, 100:1 ratio, designed to ensure best possible results using radio headphones, loud-speaker, or valve set with sensitive microphone, 4s. 6d.; primary and secondary terminals fitted; full directions and diagrams of connections free; orders posted by return.—FREDK. ADOLPH, Electrical Engineer, 27, Fitzroy Street, London, W.1.

Dynamo. Exceptional Bargain.—Totally enclosed Modern Shunt-wound Ball-bearing type 12- to 20-volt (approx.) 10-amp. Charging and Lighting Dynamo, with carbon block brushes, and fitted with pulley and slide rails; lights comfortably 12 H.W. lamps of 16 candle-power; included also is switchboard, fitted with main switch, fuse-box, amp. meter, and automatic magnetic charging cut-out; cost over £12; great sacrifice £3 10s.; guarantee given.—UNIVERSAL MOTOR COMPANY, St. James' Road, Derby.

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Patents Handbook, Advice free.—HUGHES AND YOUNG (Estd. 1829), 3, Cherry Street, Birmingham; Outer Temple, London.

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If You Want Reasonable Charges, precision in turning, etc., tool-making, model and experimental work, apply NORMAN GARDNER, 12, Glazbury Road, London, W.14.—Below.

Piston Rings and Model Cylinder Fitting a speciality.—NORMAN GARDNER (above).

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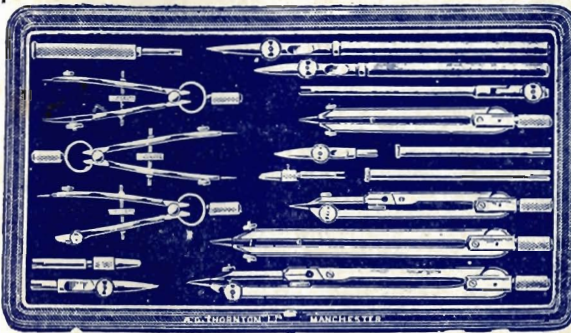
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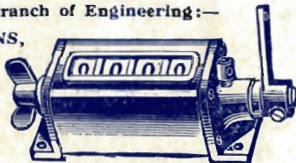
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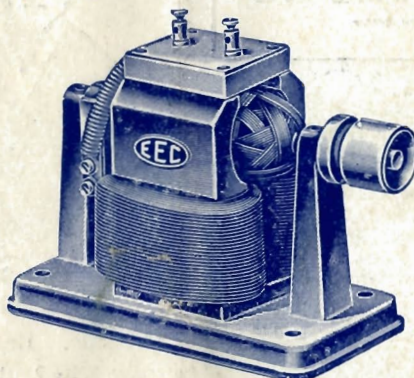


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